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PESTICIDES ABSTRACTS (formerly Health Aspects of Pesticides Abstract Bulletin) is a monthly publication of the Management Support Division of the Office of Pesticides and Toxic Substances, Environmental Protection Agency.

The purpose of this publication is to foster current awareness of the major worldwide literature pertaining to the effects of pesticides as defined in the Table of Contents. The publication represents a monthly review of more than 2,000 primary and secondary sources. A list of periodicals from which articles have been abstracted appears annually in the January issue. Subjects and authors of abstracted articles are cross-referenced in quarterly and annual indexes. Reprint requests should be directed to the author of the complete article.

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80-2701. Alt, K. F.; Miranowski, J. A. (Dep. Econ., Iowa State Univ., Ames, Iowa) **Uncertainty and the choice of agricultural pollution abatement policy.** *Agric. Econ. Res.* 31(4): 48-50; 1979 (5 references).

Methods for calculating the appropriate agricultural pollution abatement policy are discussed. With demands for a cleaner environment rising, farmers must be encouraged to lower their emission of pollutants. The policy options proposed for agriculture include: charges, subsidies, marketable rights, and direct regulation. Each of these alternatives is described, and it is demonstrated how the merits of these policies can be examined through use of pollution abatement demand and supply functions. The optimal level of pollution abatement is defined as the level at which the cost of supplying the last unit equals the price that society is willing to pay for that unit. Since knowledge of society's demand for a cleaner environment and society's willingness to pay for pollution abatement is not complete, an error in the level of pollution abatement selected is likely. A method for minimizing the social cost of an error using elastic and inelastic abatement supply curves is presented.

80-2702. Seitz, W. D. (Inst. Envir. Stud., Univ. Illinois, Champaign-Urbana, IL) **Environmental regulation: a framework for determining research needs.** *Am. J. Agric. Econ.* 61(4): 818-823; 1979.

A commentary is presented in which a means of identifying important research areas relating to environmental problems is discussed. Pollution by agricultural chemicals and the development of pest resistance are seen as major environmental threats. Factors complicating the problem are twofold: in many cases the adverse impacts of pollution will occur in the future, and often the economic loss due to a pollutant is small relative to the value of the normal good with which the pollutant is associated. The need for regulation of pollutants is recognized and will continue to reflect changes in environmental conditions. Research activities which may be pursued in relation to this process include analyzing current performance, identifying policy alternatives, analyzing the potential performance of alternatives, researching various policy combinations, determining long-run impacts and the equitability of policy alternatives, analyzing institutions, and assessing policy performance. It is pointed out that cooperation of interdisciplinary research teams may be beneficial.

80-2703. Daberkow, S. G.; Fritsch, C. F. (Econ., Stat. & Coop. Serv., USDA, Washington, DC) **Agricultural workplace safety: a perspective on research needs.** *Am. J. Agric. Econ.* 61(4): 824-835; 1979 (39 references).

A review is presented which examines the current status of agricultural workplace safety and suggests future research for improvement of conditions. Accident causal factors (improper employee behavior, hazardous work environment) are discussed along with safety policy alternatives. The alternatives presented include payment of risk premiums to workers with hazardous duties, judicial action, insurance, and legislation. The application of each policy to the agricultural sector is described. It is pointed out that cases of machine failure are more likely to bring compensation than misuse of chemicals due to the difficulties associated with identifying chemical-related maladies. Three recommendations for further research are made: a comprehensive review of available agricultural workplace safety statistics, evaluation of the effectiveness of the public provision of workplace safety information, and a comprehensive evaluation of the current piecemeal approach to agricultural workplace safety.

80-2704. Siebert, J. W. (Dep. Agric. Econ., Purdue Univ., Lafeyette, IN) **Beekeeping, pollination, and externalities in California agriculture.** *Am. J. Agric. Econ.* 62(2): 165-171; 1980 (19 references).

Costs incurred by beekeepers and almond growers from pesticide induced beekills are reviewed. On average 11% of the bees in California are killed each year by pesticides. An equilibrium economic framework is outlined which can be used to estimate the external costs of beekills induced by pesticides on beekeepers and almond growers. The Tulare County citrus nectary is used to illustrate this model. In 1974 beekeepers suffered severe losses from beekills. The agricultural commissioner imposed strict protective practices and beekills were substantially reduced in following years. The advantages and the costs to both citrus growers and beekeepers from changing the pesticides (from carbaryl and azinophos-methyl to methomyl) and the time of spraying (from day to night) are described. Suggestions for evening out the costs of the protective practices among beekeepers and citrus growers are given.

80-2705. Kahn, E.; Whorton, D. (Epidemiol. Stud. Lab. Sect., California Dep. Health Serv., Berkeley, CA 94704) **Re sperm count depression in pesticide applicators exposed to dibromochloropropane.** *Am. J. Epidemiol.* 112(1): 161-164; 1980 (7 references).

In this letter to the editor questions are raised concerning a study published recently dealing with occupational hazards arising from the chemical dibromochloropropane (DBCP). The letter charges that the original article contains statements which are misleading and inappropriate. Specific questions raised concern the manner in which the statistical analyses were conducted, the use of statistical significance without consideration given to trends in evaluating biological data, and the insufficient emphasis given to the major concern in the industry in relation to this particular chemical, which is its carcinogenicity rather than its gonadal toxicity. The presumed reversibility of the depression in sperm count

caused by this chemical is also challenged in this letter, and questions are raised concerning the use of the term clinical infertility.

80-2706. Glass, R. (Int. Cent. Diarrhoeal Dis. Res., Dacca-2, Bangladesh) **Re sperm count depression in pesticide applicators exposed to dibromochloropropane.** *Am. J. Epidemiol.* 112(1): 164-165; 1980 (2 references).

In this response to a letter to the editor, the author of the original paper supports his study which demonstrated a dose-response effect between exposure to dibromochloropropane (DBCP) and sperm-count depression. The author argues that the controls used in his study were both appropriate and simultaneous, both matters which had been questioned in the letter to the editor. Caution is advised against comparing the findings of this study using exposed populations of agricultural workers with a control group of unknown origin.

80-2707. Metcalf, R. L. (Dep. Entomol., Univ. Illinois Urbana-Champaign, Urbana, IL 61801) **Changing role of insecticides in crop protection.** *Annu. Rev. Entomol.* 25: 219-256; 1980 (143 references).

An analysis of the changes that have occurred in insecticide use in the United States since 1946 is presented. This review covers the role of insecticides in crop protection; the economics of insecticide use, including the rising costs of insecticides, their increasing complexity, the costs of development and the benefit to cost ratio; cross and multiple resistance in insects and the persistence of resistant genes; pest and potential pest resurgence; effects on human health, including carcinogenesis and neurotoxicity; and insecticides effects on environmental quality, including toxicity to birds and fish and cases of serious, accidental environmental damage.

80-2708. Mrozek, H. (Lab. Mikrobiol., Henkel KGaA, Dusseldorf, BRD) **Gesichtspunkte fur eine zweckmazzige auswahl geeigneter desinfektionswirkstoffe. [Criteria for systematic selection of suitable disinfectant active ingredients.]** *Arch. Lebensmittelhyg.* 31(3): 91-99; 1980 (22 references) (German).

The mechanisms of action, inactivation and reactivation of the active ingredients of several disinfectant compounds, including some pesticides, are reviewed. The discrepancy between instructions for maximum efficacy and those for optimal safety is discussed in detail. Restrictions on the applicability of certain procedures to specified purposes are frequently caused by the placing of too high a priority on standardization of testing methods. Standardization of procedures to test the compounds safety and applicability is suggested to reduce maximum efficiency. Test methods that have some allowance for the particular circumstances in which the agent will be used are suggested.

80-2709. Rohleder, H. (Inst. Oekol. Chem., Ges. Strahlen & Umweltforsch., D-8042 Neuherberg, BRD) **Multimatrix and multiresidue methods in pesticides analysis.** *Ber. Kernforschungsanlage Juelich* 1534: 116-129; 1980 (9 references).

A review is presented of the development of methods of pesticide analysis that are applicable to diverse matrices (multimatrix) and involve the simultaneous recording of many compounds (multiresidue). In the 1950's, special analysis techniques were used for the extraction, cleanup and determination of DDT, lindane and other organochlorines. At the present there seems to be a trend from special methods to more generally applicable analysis schemes. High sensitivity and high accuracy are also required in the analysis of pesticides. The main steps of analysis (extraction, fractionation, and separation and estimation) are described, and the most efficient methods known to date are discussed. Criteria for choosing the appropriate method are considered, with both a table listing the important analytical methods and their main applicabilities, and a checklist of criteria being presented.

80-2710. Hart, B. (Plant Prot. Div., Imp. Chem. Ind. Ltd., Haslemere, Surrey GU 27 3JE, England) **Non-fatal lung disease due to inhalation of nebulised paraquat.** *Br. Med. J.* 281(6232): 63-64; 1980 (2 references).

In this letter to the editor the diagnosis of interstital lung damage in an earlier reported case wherein a patient had inhaled nebulized paraquat is questioned. The diagnosis was based mainly on pulmonary function tests. The chest radiograph was clear. The patient was obese with a wheeze. No transfer factor was available and there were no previous recordings to compare with those taken 2 mo after the incident. No mention was made in the original report of eye, throat, or nasal irritation, which should have been present if exposure to paraquat spray had been sufficient to cause lung damage. Pulmonary damage from inhalation of paraquat has not been reported in 20 yr of worldwide usage of this herbicide.

80-2711. Anonymous **GAO, Velsicol differ on chlordane.** *Chem. Eng. News* 58(34): 25; 1980.

The GAO is asking for a formal review of the risks and benefits of chlordane as a result of an ongoing study of the use of pesticides in urban areas and around the home. The GAO apparently feels the EPA should begin a rebuttable presumption against registration for the pesticide. A 4 yr study of employees of Velsicol, the chemical company which produces chlordane, has concluded that there is no evidence of long-term health effects on workers. Questions concerning chlordane first arose in 1974, when it was found that chlordane caused cancer in laboratory mice. Also discussed is an Air Force study on homes contaminated by chlordane which entered the houses through the heating system ducts and through the concrete slabs under the houses after they had been treated for termites.

80-2712. Venkataramaiah, C.; Reddy, A. J.; Chandrasekharam, V. (Dep. Bot., S. V. Univ. Coll., Tirupati 517502, India) **On DDT-induced radicular proliferation in *Phaseolus mungo* Linn.** *Curr. Sci.* 49(6): 242-243; 1980 (8 references).

Experiments on the effect of DDT on aspects of *Phaseolus mungo* seedling morphogenesis are discussed in this letter to the editor. Abnormal seedlings showing several roots of almost equal size rather than the typical taproot-like radicle were noted among treated seedlings in preliminary experiments. In further studies seedlings were treated with 0-50 ppm DDT 24 hr after germination. The incidence of radicular proliferation was generally found to increase with increased DDT levels. DDT was also found to decrease growth of seedlings.

80-2713. Ramanujam, S. N.; Ratha, B. K. (Dep. Zool., North-Eastern Hill Univ., Sillong 793014, India) **Studies on piscicidal plants of northeastern India: hope for an indigenous plant poison for fish nursery management.** *Curr. Sci.* 49(6): 251-252; 1980 (12 references).

An effort to identify indigenous plants for use as fish poisons in India is reported. Toxicity studies were carried out on the bark, leaf, root and fruits of five plants. Plant parts were air-dried, then finely powdered. Fish (a minimum of 10/jar) were placed in 10 *l* jars and exposed to varying concentrations of the plant material. The poisons acted on the nervous system causing paralysis, or on the blood resulting in hemolysis, or directly on the muscle activity. The minimum effective concentration ranged from 50-70 ppm for *Zanthoxylum armatus* to 150-200 ppm for *Potentia fulgens.* The authors contend that further studies on these plants may lead to their widespread use in Indian fish management, thus precluding the necessity of importing other products such as rotenone or jugulone.

80-2714. Altieri, M. A. (Univ. Florida, Gainesville, FL 32601) **The design of pest stable corn agroecosystems based on the manipulation of insect populations through weed management.** *Diss. Abstr. Int. B* 41(1): 59; 1980.

Populations of insect pests and associated predaceous arthropods were sampled by direct observation and other relative methods on simple and diverse corn habitats at two sites in North Florida during 1978 and 1979. Through various cultural manipulations certain weed communities were selectively established in alternate rows within corn plots. Fall armyworm *(Spodoptera frugiperda)* incidence was consistently higher in the weed-free habitats than in the corn habitats containing natural weed complexes or selected weed associations. Corn earworm *(Heliothis zea)* damage was similar in all weed-free and weedy treatments suggesting that this insect is not greatly affected by weed diversity. Only the diversification of corn with a strip of soybean significantly reduced corn earworm damage. Differences in the abundance of ground predators between plots could not be attributed to weed diversity. Predator pressure was monitored using *Spodoptera* eggs as introduced prey. The numbers of fall armyworm eggs taken were not shown to be related to numbers of predators present nor to the type and density of the vegetation. Corn systems mulched with rye straw had the lowest infestation of fall armyworm and the highest numbers of predaceous earwigs. The mean number of predator species and individuals was higher at the site where corn plots were surrounded by complex vegetation than at the site surrounded by annual crops, probably because diverse adjacent areas provided refuge to predators, thus acting as colonization sources. (Author abstract by permission, abridged. Copies of the thesis are available from University Microfilms, order no. 8015445)

80-2715. Karanov, E. N.; Demirov, G. D.; Spassov, A. V. (Inst. Plant Physiol., Bulgarian Acad. Sci., Sofia, Bulgaria) **Auxin activity of some 4,5-diphenyl-1,2, 4-triazolyl-(3)- alkylcarboxylic acids.** *Dokl. Bolg. Akad. Nauk* 33(3): 397-900; 1980 (8 references).

The potassium salts of diphenyl triazolyl acids were investigated for effects on the length and weight of stem segments of Alaska variety peas and the effects on the length of the segments of Early-12 wheat coleoptiles. All compounds demonstrated auxin activity, with the highest activity being manifested by those compounds containing an odd number of methylene groups between the triazolic ring and the carboxylic groups. Acids with an even number of methylene groups demonstrated much weaker auxin activity. The side chains of 4,5-diphenyl-1,2, 4-triazolyl-3-alkyl- carboxylic acids are probably metabolized in pea stem sectors by β-oxidation. Auxin activity was also noted in the wheat coleoptile studies with the highest activity again demonstrated by compounds with an odd number of methylene groups. However, in this case no conclusions were drawn concerning metabolism of the side chains.

80-2716. Nasar, S. K. T.; Singh, S. (Biosci. Res. Cent., TNB Coll., Bhagalpur Univ., Bhagalpur 812007, India) **Arrest of somatic cells at G_2 by Sevin (pesticide).** *Experientia* 36(8): 948-949; 1980 (14 references).

The treatment of onion root meristems with the pesticide Sevin (carbaryl, 1-naphthyl *n*-methyl carbamate) induces an accumulation of interphase nuclei with a larger diameter, and a subsequent decrease in the index of smaller nuclei. It is concluded that Sevin depresses mitosis by arresting cells at G_2 without affecting DNA synthesis. (Author abstract by permission)

80-2717. Cone, W. W.; Drake, S. R. (AR, SEA, USDA, Washington State Univ., Prosser, WA 99360) **Influence of acephate on asparagus flavor and its effectiveness for con-**

trol of redbacked cutworms. *HortScience* 15(1): 31; 1980 (2 references).

A field study was carried out to determine the effectiveness of the insecticide acephate in the control of the redbacked cutworm *(Euxua ochrogaster)* and its influence on yield and flavor of asparagus. Plots of asparagus were treated with acephate at rates of 0. 0.8, 1.1, 1.7 and 2.2 kg/ha in 1977, and at rates of 0, 0.8, 1.1, and 1.7 kg/ha in 1978. The application dates were May 11 and 25, and June 6 in 1977 and May 2, 11, and 19 in 1978. Asparagus was harvested for commercial processing immediately after spraying and 1, 3 and 7 days following the insecticide application. Evaluation for cutworm control included number of injured spears, total number of spears, and spear weight, and indicated that acephate economically controls the cutworm at 0.8 kg/ha. Gains in net yield of 306, 228 and 304 kg/ha were realized in plots treated with 0.8, 1.1 and 1.7 kg acephate/ha. The harvested samples also underwent a sensory evaluation, and it was determined that an off flavor was imparted to the asparagus by the 2.2 kg/ha rate.

80-2718. El-Guindy, M. A.; El-Sebae, A. H.; El-Assar, M. R. S. (Cent. Agric. Pestic. Lab., Plant Prot. Inst., Minist. Agric., Dekki, Egypt) **The effect of Lannate and insect growth regulators on late insect stages of the bollworm *Heliothis armigara* (Hbn).** *Int. Pest Control* 22(3): 53-55; 1980 (7 references).

The action of juvenile hormone analogues AR-515 and R-20458 on late insect stages of *Heliothis armigera* as well as the joint action of Lannate (methomyl) and ZR-515 on 2-day old pupae. The pupal stage proved to be the most sensitive to the action of the hormone R-20458, following by 6th instar larvae and then the pre-pupal stage. Differences in response of late insect stages to hormone action may be due to differences in the time of application and the insect stage. Treatment of late insect stages with R-20458 decreased the mean number of eggs deposited and percentages hatched. The reproduction of adult females emerging from 2 day old pupae treated with the juvenoid ZR-515 was noted. The combined action of Lannate and ZR-515 drastically inhibited emergence, normal adult development, mean deposited eggs per mated female, and percentage hatched, suggesting a high synergistic action of the 2 chemicals.

80-2719. Pemberton, J. M. (Dep. Microbiol., Univ. Queensland, St. Lucia, Queensland 4067, Australia) **2,4-D and 2,4,5-T: Reasons for comfort and concern.** *J. Aust. Inst. Agric. Sci.* 45(3): 165-168; 1979 (13 references).

The conflict between the economic benefit and the potential biological hazards of 2,4-D and 2,4,5-T is reviewed. The discovery of these compounds in the early 1940s is described, along with their structure and synthesis. It is pointed out that small quantitites of the highly toxic contaminant TCDD are produced during 2,4,5-T production, and methods for controlling TCDD levels are discussed. Accidents that indicate TCDD toxicity include the accidental release of large amounts of TCDD and 2,4,5-trichlorophenol in Seveso, Italy, which resulted in the death of 1100 animals, the production of skin disorders in 300 people, and the hospitalization of 46 people. Toxicity studies are mentioned, and it is pointed out that while TCDD has been known to be teratogenic, new evidence indicates a possible teratogenic effect of 2,4,5-T, also. 2,4-D is known to persist from a few days to a few wk, with 2,4,5-T being considerably more persistent. The mechanism of pesticide-degrading ability among microbes is discussed.

80-2720. Draughon, F. A.; Link, M. A.; Ayres, J. C. (Dep. Food Sci., Univ. Georgia, Athens, GA 30602) **Inhibition of patulin production with the insecticide naled.** *J. Food Prot.* 43(7): 575-578; 1980 (18 references).

Production of the biocide patulin and fungal growth were completely inhibited by the addition of naled at 100 ppm to dextrose broth cultures of *Penicillium urticae* NRRL 994 at the time of inoculation. Patulin production was inhibited by 59% by the addition of naled at 10 mg/l at the time of inoculation. Mycelial growth of *P. urticae* was completely inhibited by naled (100 mg/l) 15 days before inoculation. Patulin production was inhibited 100% when naled was added up to 30 days prior to inoculation. The effectiveness of naled was decreased when added to cultures already visibly contaminated with *P. urticae.* When naled was added to cultures up to 6 days after growth had started, high inhibition was obtained. When 100 mg of naled/l was applied to apples before inoculation and stored at 25°C, production of patulin was inhibited by 76% and tissue damage was reduced by 43%. It is suggested that naled may be particularly useful in cases where apples have been damaged or must be held under conditions which are favorable to fungal growth.

80-2721. Majumder, S. K. (Cent. Food Technol. Res. Inst., Mysore, India) **Storage and pest control strategy for preservation of foodgrains in India.** *J. Food Sci. Technol.* 17(1-2): 55-58; 1980 (20 references).

Studies conducted during the past three decades for finding ways in which insect infestation of needed food supplies in India could be avoided are discussed. The need for adaptive changes in pest control techniques in that country due to the varying agro-economic and ecological conditions found there is considered. Pre-harvest prophylaxis will disinfect the grain before storage and exert a protective action during subsequent stages of processing. Improved storage structures have been developed which will keep the grain pest-free during this time. Insect proofing of gunny bags and other storage containers is also useful. Non-toxic grain protectants used include activated earth, particularly kaolin, which has highly insecticidal

properties. Tricalcium phosphate, also highly toxic to insects, forms the base of another product which is innocuous to humans and animals. Favorable use has also been made of bacterial insecticides.

80-2722. Hughes, T. J.; Pellizzari, E.; Little, L.; Sparacino, C.; Kolber, A. (Res. Triangle Inst., Res. Triangle Park, NC 27709) **Ambient air pollutants: collection, chemical characterization and mutagenicity testing.** *Mutat. Res.* 76(1): 51-83; 1980 (212 references).

This review discusses sources and types of air pollution; collection, fractionation and chemical analysis of air samples; and *in vitro* bioassay systems capable of quantitating mutagenicity of these air samples and their components. Case studies utilizing bioassays to detect mutagenicity, such as the *Tradescantia* plant assay (on-site) and the Ames/*Salmonella* bacterial assay (off-site) are reviewed. Problems such as sample size, complexity of the air sample (both vapor-phase and particulate), and artifact generation are discussed. The state-of-the-art techniques for air-pollution analysis (an integrated biological and chemical approach) are reviewed, and directions for future research are recommended. Methods for collection of air particulate and vapors are reviewed, as are solvent extraction and further fractionation of particulate organic matter into various chemical groups (e.g. acid, base, PNA, PN, NPN). Methods for chemical identification of individual components by GC/MS/computer systems and collection and assay methods for vapor-phase components are included. Experimental results comparing *Tradescantia* and Ames/*Salmonella* mutagenicity studies are presented (certain vapor-phase organic substances were highly mutagenic for *Tradescantia* plant stamen hairs). Bacterial mutagenesis test results of air particulates and their extracts indicated the major portion of the activity resided in the acid, base and PNA fractions. Different types of mutagens identified in fractionated air-particulate extracts are discussed, and recommendations for the use of integrated chemical-analytical and biological screening systems in further studies of toxic air pollutants are proposed. (Author abstract by permission)

80-2723. Panda, B. B.; Sharma, C. B. S. R. (Cytogenet. Lab., Dep. Bot., Berhampur Univ., Berhampur 760007, India) **Cytogenic hazards from agricultural chemicals. 3. Monitoring the cytogenic activity of trichlorfon and dichlorvos in *Hordeum vulgare*.** *Mutat. Res.* 78(4): 341-345; 1980 (31 references).

The toxicity of trichlorfon and dichlorvos to initial growth processes, such as germination and seedling growth, and to chromosomes of embryonic shoot meristems and sporogenous tissue was assessed by the progeny test of *Hordeum vulgare*. The methodology involved in the test is described in detail. Dichlorvos was more effective than trichlorfon, whose effects sometimes even surpassed those of EMS. The frequency of late effects in the PMCs was higher than that of the initial effects in the ESCs. Probable reasons for this differential cellular behavior, and the consequences of the chromotoxic responses, are discussed. (Author abstract by permission)

80-2724. Newman, R. (Ivon Watkins-Dow Ltd., New Plymouth, ID) **2,4,5-T debate: manufacturers' viewpoint.** *N. Z. J. Agric.* 140(4): 28-30; 1980.

In this letter to the editor the public relations executive from a manufacturer of 2,4,5-T states that the chemical is safe for use, and that, based on scientific evidence, no proof of harmful reactions arising from use of 2,4,5-T has been offered. It is stated that many independent inquiries into the safety of 2,4,5-T have already been conducted in various countries. The most recent was conducted by the American Farm Bureau in mid-1979. All sides of the 2,4,5-T controversy were investigated by a group of 59 scientists from the fields of medicine, toxicology, ecology, agriculture and chemistry from 7 countries and 20 of the US states. However, the ban on 2,4,5-T in the United States has not yet been lifted. Excerpts from other sources are included to indicate the safety of 2,4,5-T. Some mention is made of the contaminant TCDD, present in 2,4,5-T, and its extreme toxicity.

80-2725. Preest, D. (For. Res. Inst., New Zealand For. Serv., Rotorua, New Zealand) **Ester formation and surfactant affect response of radiata pine and gorse seedlings to 2,4,5-T.** *N. Z. J. For. Sci.* 9(1): 44-52; 1979 (10 references).

The butyl and iso-octyl esters of 2,4,5-T were applied at four rates, 0.5, 1.0, 2.0, and 3.0 kg a.e./ha, both with and without 0.5% v/v surfactant. Applications were made to small nursery plots containing 9 1/0 radiata pine and 16 1/0 gorse transplants within the central area. Treatments were made with an overhead boom sprayer. The iso-octyl ester caused more seedling gorse mortality and growth suppression than did the butyl ester. When the surfactant was added, growth suppression and mortality were increased with the iso-octyl ester. This was not true for the butyl ester. Neither tree height nor fresh weight were significantly altered by iso-octyl application. Tree height response was improved by the addition of surfactant. Use of iso-octyl plus surfactant produced larger more robust trees than the butyl ester or treatments without surfactant.

80-2726. Anonymous **Report to the Minister of Health of an investigation into allegations of an association between human congenital defects and 2,4,5-T spraying in and around Te Kuiti.** *N. Z. Med. J.* 91(658): 314-315; 1980.

Possible maternal exposure to 2,4,5-T is investigated in two cases of infant deaths. Aerial spraying of

2,4,5-T had occurred on a block of 9 ha about 1.609 kg from the house of the first family interviewed on 21 October 1978, and a second spraying occurred in November of 1978. During the period of the wife's pregnancy, both she and her husband noticed a strong smell. The time of the spraying occurred during the ninth wk after conception in the case of this family. It is stated that any effect from 2,4,5-T would necessitate that exposure to the chemical occurred during the first 7 wk of pregnancy. In the second family interviewed, the wife noted a strong smell which she felt to be a weedkiller at a time which corresponded to wk 12-15 of gestation. Spraying of 2,4,5-T had occurred about 1.207 kg from the home of this family in November of 1978. While plant damage was noticed by the family interviewed, investigators could not find evidence of such which resulted from herbicide application. It was concluded from these investigations that neither woman was exposed to 2,4,5-T or any other pesticide at any time during her pregnancy.

80-2727. Kjellstrom, T. (Dep. Community Health, Univ. Auckland, Auckland, New Zealand) **2,4,5-T and cancer.** *N. Z. Med. J.* 91(658): 318; 1980 (12 references).

Several Swedish studies are cited which provide evidence for an association between exposure to 2,4,5-T and the occurrence of soft tissue carcinoma. One report suggests an increased risk of such sarcomas occurring among men exposed to phenoxy acids, including 2,4,5-T. An outgrowth of this first study demonstrated that the relative risk of these concerns developing was 5.3 among those exposed to phenoxy acids only and 6.6 for people exposed to chlorophenols only. Each of these risks was viewed as statistically significant. In a third study of 110 patients and 219 controls, the relative risk for those individuals exposed to chlorophenols was 3.3 and for those exposed only to phenoxy acids, 6.8. An increased risk for the development of malignant lymphomas was also noted for phenoxy acid exposure.

80-2728. Smith, A. H. (Wellington Clin. Sch. Med., Wellington, New Zealand) **2,4,5-T and cancer.** *N. Z. Med. J.* 91(658): 318-319; 1980.

In this letter the author is remarking on an original letter concerned with possible relations between exposure to phenoxyacetic acids and chlorophenols and the subsequent development of soft tissue sarcomas. The present author states that because TCDD is not present in some of the chemicals which demonstrated an increased risk of cancer in the cited Swedish studies, the common factor may be the solvents used in herbicide applications. However, this author, among with those of the original letter, urge that there is sufficient data currently available for action to be taken to prevent excessive exposure to these chemicals, particularly among individuals involved with spraying the substances in agricultural settings.

80-2729. Anonymous **What to do about new herbicides.** *Nature (London)* 286(5770): 193-194; 1980.

A commentary is presented in which British regulation of the herbicide 2,4,5-T and its contaminant dioxin is discussed. The herbicidal benefits of 2,4,5-T are emphasized, and it is pointed out that the toxic, teratogenic and carcinogenic potential of it and its dioxin contaminant (TCDD) are not totally clear. More studies are needed which distinguish between the effects of 2,4,5-T and dioxin. In addition, the total quantity of 2,4,5-T being used in Britain will have to be more accurately assessed; initial estimates were 3 tons/yr, but the amount has since been amended to 100 tons/yr. It was urged that due to the important agricultural value of 2,4,5-T, its use should not be banned until its effects are clarified.

80-2730. Amrhein, N.; Schab, J.; Steinrucken, H. C. (Arbeitsgruppe Hormonphysiol. Pflanzen, Lehrstuhl Pflanzenphysiol., Ruhr Univ., D-4630 Bochum, BRD) **The mode of action of the herbicide glyphosate.** *Naturwissenschaften* 67(7): 356-357; 1980 (10 references).

Work on the mode of action of the broad-spectrum postemergence herbicide glyphosate (*N*-(phosphonomethyl) -glycine) is described. Previous work on buckwheat, which showed that shikimate was not metabolized at all in the presence of glyphosate, suggests that glyphosate may inhibit any of the three enzymes that convert shikimate to chorismate: shikimate kinase, 5-enolpyruvylshikimate- 3-phosphate synthase, or chorismate synthase. The organism used in this study was an extract of the multiply blocked auxotroph *Aerobacter aerogenes* strain 62-1, in which the metabolic conversion of shikimate to anthranilate can be conveniently studied. The overall reaction from shikimate to anthranilate was inhibited 50% at 5-7 μM glyphosate, and caused accumulation of an acidic polar product. Shikimate was released from this product by treatment with alkaline phosphatase, indicating that the product was shikimate-3-phosphate, and the enzyme inhibited by glyphosate was 5-enolpyruvylshikimate-3-phosphate synthase.

80-2731. Ellinger, C. A.; Chan, B. C.; Waiss, A. C. (West. Reg. Res. Cent., SEA, USDA, Berkeley, CA 94710) **Flavonoids as larval growth inhibitors.** *Naturwissenschaften* 67(7): 358-360; 1980 (13 references).

Flavonoids with varied flavonoid hydroxylation patterns were examined for their effects on larval growth of

the corn earworm. In addition, the effects of glycosylation, partial reduction of the ring system, methylation of the hydroxyl substituents, and positional alternation of the pendant B-ring were considered. Hatchling corn earworms *(Heliothis zea)* larvae were fed artificial diet containing the test compounds at 2-10 mmol/kg wet wt. Larvae were weighed after 12 days. For ease of comparison between compounds, the effective concentration necessary to reduce larval growth to 50% of control values (ED50) was calculated. Twenty inhibitory and twenty-two noninhibitory flavonoids are listed. It was shown that adjacent *(ortho)* substitution of phenolic hydroxyl groups is necessary for inhibitory activity. However, this alone is not sufficient, and polarity and solubility effects are considered. The possible basis for the inhibitory activity imparted by the adjacent hydroxyl orientation is discussed.

80-2732. Schatz, G. S. (Author address not given) **Pesticides, benefit-cost analysis, and the burden of regulation.** *News Rep.* 30(8): 1-5; 1980.

The findings of the Committee on Prototype Explicit Analyses for Pesticides are presented and reviewed. The assessment and appraisal of risk appears particularly difficult due to inadequate pertinent scientific literature. The simple acceptance of numerical data appearing in print, without regard for the fact that such data may be in error by as much as 1,000 to 10,000%, is also cited as encouraging errors in appraisals of risk/benefit correlations. The Office of Pesticide Programs is urged to organize procedures which would reduce risks brought about by the overwhelming workload-produced delays in processing. It was suggested that more weight statistically be given to the number of people who would be exposed to the pesticide in question and that site visits should be considered routine practice.

80-2733. Akiba, Y.; Sekijima, Y.; Aizawa, K.; Fujiyoshi, N. (Saitama-ken Sericultural Exp. Stn., Kumagaya, Saitama 360, Japan) **[Microbial ecological studies on *Bacillus thuringiensis*. 3. Effect of pH on the growth of *Bacillus thuringiensis* in soil extracts.]** *Nippon Oyo Dobutsu Konchu Gakkai-Shi (Jpn. J. Appl. Entomol. Zool.)* 23(4): 220-223; 1979 (7 references) (Japanese).

Studies were designed to determine the effects of pH of soil extracts on the growth of the lepidoptera biological control agent *Bacillus thuringiensis* (strain AF 101 and subspecies *kurstaki*). Eight soil samples from three mulberry plantations were used, and pH values of the soil extracts were adjusted with 0.1 *N* HCl or 0.1 *N* NaOH prior to inoculation with the bacteria. Strain AF 101 could grow in samples with a pH of 6.1-6.7, but when these samples were adjusted to pH 4.5-5.6, no growth occurred. Conversely, strain AF 101 could not grow in samples with pH 4.5-4.8, but when these samples were adjusted to 5.4-8.5, the strain could grow. Similar results were obtained with subspecies *kurstaki*. It was concluded that acidic soil extracts inhibited growth, and that growth occurred at pH 4.8 for *kurstaki*.

80-2734. Germani, G. (Lab. Nematol. ORSTOM, B.P. 1.386 Dakar, Senegal) **Action directe et remanente d'un traitement nematicide du sol sur 3 cultivars d'arachide au Senegal. [Direct and residual action of a nematicide treatment of the soil on 3 groundnut cultivars in Senegal.]** *Oleagineux* 34(8-9): 399-404; 1979 (10 references).

Field studies were designed to test the direct and residual effects of the nematicide DBCP on 3 groundnut cultivars. The first experiment consisted of 6 randomized blocks with 2 treatments: fumigated with DBCP in 1976 (1 yr before 1977 crop), and nonfumigated. In the second design, 9 randomized blocks received 2 treatments: fumigated with DBCP in 1977 (14 days before planting) and non-fumigated. Treatment was with the commercial nematicide Nemagon at a rate of 25 *l*/ha. In plots treated in 1977 (immediately before planting), *Scuttelonema cavenessi* were almost completely absent, while the controls contained up to 33,000 nematodes/100 g roots. Pod yields and straw yields were significantly higher in treated plots, compared with controls. It was determined that, in relation to pod yields and straw yields, the residual effects of DBCP applied 1 yr before planting did not significantly differ from the effects of DBCP applied immediately before planting. It was also suggested that DBCP may have a positive influence on the development of the roots, on nodulation and on N_2-fixation.

80-2735. Worthing, C. R., ed. (Author address not given) **The Pesticide Manual.** *The Pesticide Manual. A World Compendium. Sixth Edition. (British Crop Protection Council: Croydon):* 655 pp.; 1980.

The Pesticide Manual, sixth edition, is an updated reference book that contains 47 new entries in the main section. Compounds from previous editions that are currently only of historical interest or that have been superseded by others are listed in an appendix. This edition has 4 indexes; Wiswesser Line-Formula notation, molecular formula, numeric listing of the manufacturer's or official code number, and chemical, trade or common name. The British Crop Protection Council has listed each compound by the BSI common name and given the chemical structure, Wiswesser Line-Formula Notation, molecular formula and weight. Nomenclature, common names, registry numbers and early references, manufacture and development, uses, toxicology, formulations and analysis of each entry are presented under appropriate headings. Approximately 540 pesticidal chemicals and microbial agents are included.

80-2736. Roumeliotis, G. (Inst. Plant Protect., Weed Control Lab., Patras, Greece) **Interactions between some**

wild oat herbicides and four chlorophenoxy compounds. *Pest. Artic. News Summ.* 25(4): 425-430; 1979 (9 references).

The effects of 3 wild oats herbicides (benzoylprop-ethyl, flamprop-isopropyl and flamprop-methyl) applied in mixtures with 4 chlorophenoxy herbicides (2,4-D, dichlorprop, MCPA, and mecoprop) on Maris Dove oats were examined under greenhouse conditions. All mixtures caused significantly less suppression of oat growth than that produced by the wild oat herbicides alone. The antagonistic effects observed were found to be inversely related to the quantity of wild oat herbicide present in the mixture. It was suggested that the antagonistic nature of herbicidal mixtures be considered when determining effective application levels for field conditions.

80-2737. Crabtree, G. D.; Bukovac, M. J. (Michigan State Univ., East Lansing, MI 48824) **Studies on low-volume application of plant growth substances; Part 1: ethylene production induced by 1-naphthylacetic acid, as a means of evaluating spray parameters.** *Pestic. Sci.* 11(1): 43-52; 1980 (25 references).

The evolution of ethylene, induced by 1-naphthylacetic acid (NAA), was studied as a means of evaluating spray parameters using cowpea [*Vigna sinensis* (Torner) Savi] under defined conditions as a test system. The dose-response curve was linear over the range of 1.4-14 μg per leaf. The marked production of ethylene following treatment with an active auxin, 2,4-D (2,4-dichlorophenoxyacetic acid), and the absence of its production following treatment with an inactive analogue (3,5-dichlorophenoxyacetic acid), established that ethylene production was hormonally induced. The effect of application volumes of 10-100 μl and of droplet sizes of 1-10 μl were evaluated using a constant dose (5 μg NAA per leaf); NAA was more effective when delivered to the leaf in the larger volumes but in the smaller droplet sizes. (Author abstract by permission)

80-2738. Izhar, Y.; Wysoki, M.; Gur, L. (Agric. Ext. Serv., Akko, Israel) **The effectiveness of *Bacillus thuringiensis* Berliner on *Boarmia (Ascotis) Selenaria* Achiff. (Lepidoptera, geometridae) in laboratory tests and field trials.** *Phytoparisitica* 7(2): 65-78; 1979 (55 references).

Laboratory and field tests were performed to test the effectiveness of Dipel, a commercial preparation of *Bacillus thuringiensis*, against eggs and larvae of the giant looper *[Boarmia (Ascotis) selenaria]. B. selenaria* larvae of different ages were allowed to feed for 2 days on avocado leaves treated with 0.5% or 1.5% *B. thuringiensis*, with mortality being recorded every two days. *B. selenaria* eggs deposited on filter paper were dipped in 0.5% or 1.5% concentrations of *B. thuringiensis* and observed for 18 days. Results indicated that the larval mortality rate was proportional to *B. thuringiensis* concentration, but inversely related to the age of the treated larvae. In neonate larvae, 100% mortality was obtained with both concentrations. Most of the larvae treated at the age of 10, 189 or 19 days died in the larval stage, whereas most larvae treated at 32 days died in the prepupal or pupal stage. Egg hatch was not affected, but larvae hatching from treated eggs had a very low survival (2.2%). In field tests, commercial avocado orchards were sprayed with 5 or 10 kg of *B. thuringiensis*/ ha, and 600 branch tips and 600 fruits from various trees were inspected periodically. Results were good, with no new infestations of young larvae being observed even after 51 days.

80-2739. Kehat, M.; Gothile, S.; Dunkelblum, E.; Greenberg, S. (Inst. Plant Prot., Volcani Cent., Bet Dagan, Israel) **Field evaluation of (E,E)-10,12-hexadecadienal, a component of the female sex pheromone of the spiny bollworm, *Earias insulana* (Boisd.) (Lepidoptera, Noctuidae).** *Phytoparasitica* 7(2): 99-100; 1979 (4 references).

A summary is presented of results of field tests in which the female sex pheromone component (E,E)-10,12-hexadecadienal was evaluated as an attractant for male spiny bollworms *(Earias insulana).* In a series of tests, virgin females and purified sex pheromone in quantities of 1.0, 0.1, and 0.01 mg/vial were used as attractants. One mg of (E,E)-10,12-hexadecadienal was as effective in attracting males as one virgin female. The smaller quantities resulted in decreased capture of males. It is concluded that this compound is an effective attractant for *S. insulana* males, and its use in traps for monitoring the pest population is recommended.

80-2740. Mulla, M. S.; Majori, G.; Arata, A. A. (Univ. California, Riverside, CA 92521) **Impact of biological and chemical mosquito control agents on nontarget biota in aquatic ecosystems.** *Residue Rev.* 71: 121-173; 1979 (221 references).

In this review the ecological and environmental impact of biological and chemical control agents employed for the management and suppression of pest and vector mosquitoes in aquatic habitats is analyzed. Among the biological control agents, larvivorous and predaceous fish are the most commonly utilized agents for mosquito control at the present time. The general notion that all biocontrol agents are specific and have little or no effect on the nontarget biota are dispelled on the basis of available research data. The rest of the biological control agents such as parasitic nematodes and microbial agents are generally considered to be highly specific. A variety of chemical control agents have or are being utilized for the control of aquatic stages of mosquitoes. None of the currently used materials is considered to be persistent in the aquatic habitat. Most of the materials are characterized with manifesting acute primary effects and in some cases secondary effects by eliminating or reducing herbivores or altering predator-prey relationships. In most cases the impact of

chemical control agents is of short duration, the affected organisms (both target and non-target) recovering within a few days to a few weeks. Most if not all of the chemical control agents at recommended rates of application produce marked effects in some non-target biota. These effects range from outright kill to lack of reproduction or elimination of food sources for secondary and tertiary feeders. No studies, however, have been conducted to assess the long-term ecological impact of such treatments and alterations of the ecosystem. It is generally believed that the application of chemical control agents for vector contol may produce some acute and marked short-term effects, but on cessation of the treatments the system reverts to the original equilibrium level. (Author abstract by permission, abridged)

80-2741. Zemanek, J.; Sterba, R. (Res. Inst. Plant Prod., CS-16106 Prague, Czechoslovakia) **Reakce ctyr adrud ovsa na herbicidy urcene k hukeni ovsa hluchelo. [Response of 4 oat cultivars to herbicides designed for wild oat control.]** *Rostl. Vyroba* 26(1): 7-12; 1980 (2 references) (Czech).

Results of field tolerance tests of the oat varieties Tiger, Leanda, Diadem and Saturn to Bidisin forte EC 800 (80% chlorfenprop-methyl), Carbyne B 25 (25% barban), Avenge 200/300 (920% difenzoquat), Superbarnon (20% flamprop-isopropyl) and Suffix 20 EC (20% benzoylprop-ethyl) are reported. Each herbicide was applied by a hand sprayer at the prescribed and double the prescribed doses. Phytotoxicity was rated on a scale of 1 to 9, with 1 designating no damage and 9 indicating severe damage to complete destruction. Bidisin forte was found to be the herbicide of choice for the control of *Avena fatua* in Tiger oat variety cultures because it caused slight damage even when applied in a double dose. The Leanda variety also exhibited considerable tolerance to Bidisin, in contrast to the other 2 varieties which exhibited considerable sensitivity.

80-2742. Scott, R. K. (Higham, Bury St. Edmunds, Suffolk, England) **Broom's barn experimental station.** *Rothamsted Exp. Stn. Rep.* PT 1: 55-70; 1979 (23 references).

Work carried out in 1979 is reviewed. In the discussion of plant establishment consideration is given to vigor testing and insecticide/herbicide/rotation interactions. Environmental and nutritional aspects of crop growth and productivity are discussed. The section on diseases and pests includes discussion of inoculation with virus yellows, control of *A. fabae* and powdery mildew and sulfur sprays. Rotational aspects of sugar-beet growing are also considered.

80-2743. Lewis, T. (Rothamsted Exp. Stn., Harpenden, Herts AL5 2JQ, England) **Entomology department.** *Rothamsted Exp. Stn. Rep.* PT 1: 79-93; 1979 (55 references).

Recent work concerning the use of pesticides, the benefits to crop production, and the harmful effects on the environment and wildlife, is reviewed. Pest detection and evaluation, and moth monitoring with sex attractants, are discussed. Two side effects of insecticides considered were the genetic variability of aphid populations and insecticide research, and pheromonal manipulation of honeybee behavior. Integrated control and cultural practices are also discussed.

80-2744. Elliott, M. (Rothamsted Exp. Stn., Harpenden, Herts AL5 2JQ, England) **Insecticides and fungicides department.** *Rothamsted Exp. Stn. Rep.* PT 1: 109-129; 1980 (38 references).

Recent research on the development and use of insecticides and fungicides is reviewed. The discussion of insecticides includes relationships between molecular structure and insecticidal activity of pyrethroids and the action of insecticides on insect nervous systems. Resistant houseflies and aphids, compounds influencing invertebrate behavior (pheromones and sex lures), the field poisoning of honeybees, and soil-borne pests are discussed. The behavior of pesticides in soil, foliar sprays, mass pollination apparatus and bird repellants are also considered. A list of insect species reared is given. The fungal diseases and fungicides section includes discussion of the host-parasite relationship of clubroot disease, control of soil-borne diseases of wheat, and mode of action of hydroxypyrimidine fungicides. Microbial studies on nitrification, microbial degradation of pesticides, molding of hay and analysis are also discussed.

80-2745. Anonymous **Management of bottom sediments containing toxic substances. Proceedings of the fourth U.S.-Japan Experts Meeting. October 1978, Tokyo, Japan.** *US EPA Rep.* EPA 600/3-79-102: 391 pp.; 1979.

The United States-Japan Ministerial Agreement of May 1974 provided for the exchange of environmental information in several areas of mutual concern. This report is the compilation of papers presented at the Fourth U.S.-Japan Experts Meeting on the *Management of Bottom Sediments Containing Toxic Substances*, on the 10 identified problem areas. Papers from this meeting can be found in the appropriate sections of this issue of *Pesticides Abstracts*. (Author abstract by permission)

80-2746. Engler, R. M. (Environ. Lab., Dredged Mat. Res. Program., Waterways Exp. Stn., Corp. Eng., US Army, Vicksburg, MS 39180) **Bioaccumulation of toxic substances from contaminated sediments by fish and ben-**

thic organisms. *US EPA Rep.* EPA 600/3-79-102: pp. 325-354; 1979 (10 references).

The overall objective of the Environmental Impacts and Criteria Development Project (EICDP) was to provide definitive information on the environmental impact of dredging and disposal operations and, where undesirable impacts were observed, to suggest means of eliminating or reducing such impacts. Research results show that in general dredged material in the United States is not as toxic to aquatic organisms as originally thought. Nevertheless, some sediments are toxic and disposal of these sediments may cause environmental harm. The possibility of obtaining a chemical extraction method for dredged sediments which would reflect the availability of heavy metals to organisms was evaluated. Although oil and grease levels could be high in sediments, a large part of which is routinely reported as oil and grease may be elemental sulfur, and a large part of the hydrocarbon burden of sediments is not released from sedimentary particles nor is it available for gross uptake into the aquatic organisms tested. There were a few important impacts as a result of dredged material disposal at the Ashtabula disposal site. Some chemical changes were observed. There were also changes in the benthic community which persisted throughout the study; these primarily consisted of species replacement and an increase in the abundance of some organisms. Disposal of material contaminated with PCBs in Elliott Bay during the Duwamish Waterway Aquatic Disposal Field Investigation appeared to have a minimal effect. There was no significant uptake of PCBs or metals by organisms inhabiting the disposal area or by caged animals which were held in close proximity to the disposed material for up to 3 wk. Some changes were noted in the abundance, diversity, and species composition of benthic invertebrates in the disposal area; however, similar changes in the reference area populations make it unlikely that disposal was wholly responsible for the changes. (Author abstract by permission, abridged.)

80-2747. Conway, K. E.; Cullen, R. E.; Freeman, T. E.; Cornell, J. A. (Dep. Plant Pathol., Florida Univ., Gainesville, FL) **Field evaluation of *Cercospora rodmanii* as a biological control of waterhyacinth; inoculum rate studies.** *US NTIS AD Rep.* AD-A077,187: 56 pp.; 1979 (3 references).

The fungus *Cercospora rodmanii* Conway has been shown to have good potential as a biological control agent for waterhyacinth in Florida. Previous work has shown what will happen if known quantities of the fungus are placed on an area of waterhyacinth. The current research addresses the study as optimal levels of inoculum necessary to begin an epidemic, various levels of inoculum on small populations of waterhyacinth, morphological changes of the infested plants, the effect of subsequent inoculations on infested plants, and the effect of off-the-shelf fungicides on *Cercospora rodmanii.* It was shown that the fungus can severely affect waterhyacinth in conditions that favor a reduced growth of the plant. The *Cercospora rodmanii* can be controlled with available fungicides if necessary. The greatest effect of the fungus on waterhyacinth was in reduction in height of the plants. Secondary infestations can occur with the spread of the disease from inoculated plants. (Author abstract by permission)

80-2748. Hoerauf, R. A.; Shimabukuro, R. H. (Metab. & Radiat. Res. Lab., ARS, SEA, USDA, Fargo, ND 58105) **The response of resistant and susceptible plants to diclofop-methyl.** *Weed Res.* 19(5): 293-299; 1979 (13 references).

Wild oat *(Avena fatua* L.*)* plants sprayed at the 2- or 3-leaf stages of growth with diclofop-methyl developed chlorosis over the entire leaf blade of all leaves. The leaves became necrotic 7 days after spraying. Shoot growth was inhibited. In wheat (*Triticum aestivum* L. cv. Waldron) discrete chlorotic areas developed only where the herbicide contacted the 2nd or 3rd leaf with no visible injury to new growth after treatment. Growth inhibition of susceptible oat *(Avena sativa* L. cv. Garry*)* was sensitive to placement of diclofop-methyl near the apical and meristematic sites of the plant. Chlorosis and necrosis were independent of herbicide placement. Selective herbicide placement induced chlorosis only or both chlorosis and growth inhibition. Root growth in wild oat and barley *(Hordeum vulgare* L. cv. Dickson*)* was strongly inhibited by 1.0 μM diclofop-methyl. Wild oat shoots were killed when seedlings were root treated with 10 μM diclofop-methyl. The 100 μM root treatment killed barley shoots but only stunted the growth of wheat shoots by approximately 50%. In root-treated wheat plants the shoots were turgid and developed a light purple color, whereas in foliar-treated plants the shoots developed discrete chlorotic areas. (Author abstract by permission)

80-2749. Bretherton, G.; Hallam, N. D. (Bot. Dep., Monash Univ., Clayton, Victoria 3168, Australia) **The movement of 2,4,5-trichlorophenoxyacetic acid into leaves of *Rubus procerus* P. J. Muell and its effect on chloroplast ultrastructure.** *Weed Res.* 19(5): 307-314; 1979 (22 references).

Examination of the fine structure of *Rubus procerus* leaves following application of 2,4,5-trichlorophenoxyacetic acid at field doses shows that the chloroplast is a site of herbicide action and that by 1 wk after spraying the leaves show changes indicative of accelerated senescence. Both aqueous and non-aqueous methods were used to isolate chloroplasts following treatment of leaves with radioactive 2,4,5-T. Chloroplast isolation using the non-aqueous method indicated an accumulation of radioactivity in that organelle. (Author abstract by permission)

80-2750. Bartha, R. (Dep. Biochem. & Microbiol., Cook Coll., Rutgers Univ., New Brunswick, NJ 08903) **Pesticide residues in humus.** *ASM News* 46(7): 356-360; 1980 (22 references).

Chemical bonding of various pesticides to humus is described. Some herbicides, such as diquat and paraquat, are linked to humus through the formation of charge transfer complexes to the carboxyl groups of the humus resulting in immobilization and inactivation of the chemicals. Pesticides containing substituted aniline rings, including acylanilide, phenylcarbamate, phenylurea, and dinitroaniline herbicides, nitroaniline fungicides and some acaricides, undergo transformation in the environment which allows released aniline rings to become covalently bound to humus. Pesticides which do not contain aromatic amines may be similarly bound due to the formation of aromatic amines through microbial action. Polymerization of phenolic products of re-decomposition of plant biomass into humic compounds by fungal phenol oxidases is yet another mechanism for incorporation. Humus bound residues have become in some cases sources of crop contamination. These residues are at present not detected with conventional analytical monitoring techniques.

80-2751. Benoit, F. M.; LeBel, G. L.; Williams, D. T. (Environ. Health Dir., Health Prot. Branch, Health & Welfare Canada, Ottawa, Ontario K1A 0L2, Canada) **Polycyclic aromatic hydrocarbon levels in Eastern Ontario drinking waters, 1978.** *Bull. Environ. Contam. Toxicol.* 23(6): 774-778; 1979 (4 references).

The results of a survey of polycyclic aromatic hydrocarbons (PAH) levels in Eastern Ontario drinking water are presented. Water samples from 5 municipalities (a total of 6 water treatment plants) were tested for 12 PAH and 4 oxygenated PAH derivatives (O-PAH). Analyses were performed with a chromatography mass spectrometer coupled with a 6110 data system. Individual PAH concentration ranged from 0.04 (pyrene) to 7.5 ng/l (naphthalene) in treated water and from 0.1 (acenaphthalene) to 34.4 ng/l (1-Me-phenanthrene) in untreated water. Levels of O-PAH ranged from 0.1 (perinaphthenone and anthraquinone) to 2.1 ng/l (anthraquinone). Levels in untreated water ranged from 0.3 (perinaphthenone) to 10.6 ng/l (acenaphthequinone). There was considerable variation in the ability of the treatment plants to reduce the levels of these compounds in raw water.

80-2752. Babji, A. S.; Embong, M. S.; Woon, W. W. (Dep. Food Sci. & Technol., Univ. Nebraska, Lincoln, NE 68583) **Heavy metal contents in coastal water fishes of west Malaysia.** *Bull. Environ. Contam. Toxicol.* 23(6): 830-836; 1979 (23 references).

Zinc, lead, cadmium and mercury levels in fishes caught off the coast of west Malaysia were examined. Fish were weighed, tagged and frozen until analysis. The overall means for cadmium ranged from 0.03-0.05 ppm [maximum permissible limit (MPL) 2.0 ppm]; lead, 0.21-0.32 ppm (MPL 2.0 ppm); zinc, 2.3-6.5 ppm (MPL 40 ppm); and mercury, 0.08-0.10 ppm (MPL 0.5 ppm). None of the species examined had accumulated levels considered dangerous enough to pose a health problem or indicate serious industrial pollution in the areas studied.

80-2753. Jan, J.; Mainersic, S. (Public Health Inst. Slovenia, Ljubjana, Yugoslavia) **Chlorinated benzene residues in fish in Slovenia (Yugoslavia).** *Bull. Environ. Contam. Toxicol.* 24(6): 824-827; 1980 (10 references).

Fish and mussels collected from rivers in Slovenia and the Gulf of Triest (Yugoslavia) in the fall of 1978 were analyzed for several types of chlorinated benzenes (CB). Total contents of di-, tri-, tetra-, penta-, and hexachlorobenzenes were measured. The samples were ground, extracted with hexane, and passed through a Florisil column prior to capillary gas liquid chromatography. Results are given for several species sampled in 7 different locations. The total CB residues were appreciably higher in freshwater fish caught in highly populated and industrialized regions (1.8 μg/g fat basis) than in fish from river basins of lightly polluted agricultural and woodland areas (0.2 μg/g) and marine fish (0.4 μg/g).

80-2754. Marsh, J. A. P. (Agric. Res. Council, Weed Res. Organ., Yarnton, Oxford OX5 1PF, England) **Effects of asulam on some microbial activities of three soils.** *Bull. Environ. Contam. Toxicol.* 25(1): 15-22; 1980 (9 references).

The results of studies on soil microbes and the herbicide asulam are presented. Three soil types were used in these experiments: arable (I) and grassland (III) soil from Weed Research Organization, and an arable soil from East Anglia (II). After 2 wk of greenhouse incubation to stimulate microbial growth, asulam was applied to the soils at 16 and 160 ppm (2.5 and 25 kg/ha). Routinely, samples were removed for analysis of phosphatases, dehydrogenase and urease activity, nitrogen, and CO_2 output. No significant accumulation of nitrogen was observed. The 160 ppm level was the only one that reduced CO_2 output in all three soil types, but soil type III demonstrated reduced CO_2 output at both concentrations. Soil I showed an increase in available phosphate at both concentrations of the pesticide. Soil I had the lowest enzyme levels for all the enzymes tested. This pesticide, at the lower concentration, is unlikely to have effects of agronomic importance.

80-2755. Suprock, J. F.; Vinopal, J. H.; Inatome, M. (Pest Manage. & Pestic. Monit. Div., Environ. Hyg. Ag., US Army, Aberdeen Proving Ground, MD 21010)

Oxychlordane residues in soil. *Bull. Environ. Contam. Toxicol.* 25(1): 49-54; 1980 (11 references).

The results are reported of analyses for oxychlordane residues in soils from a number of US Army bases under the Army Pesticide Monitoring Program. Soil samples were collected, extracted and cleaned up, and then analyzed by gas chromatography mass spectrometry. A total of 1258 samples were tested. Of these, 403 (32%) contained detectable residues attributable to chlordane. Twenty-nine samples (2.3%) contained oxychlordane residues. Confirmation of oxychlordane residues and data on retention times are presented.

80-2756. Apperson, C. S.; Leidy, R. B.; Eplee, R.; Carter, E. (Dep. Entomol., North Carolina State Univ., Raleigh, NC 27607) **An efficient device for collecting soil samples for pesticide residue analysis.** *Bull. Environ. Contam. Toxicol.* 25(1): 55-58; 1980 (11 references).

A fast and efficient device for collecting soil samples for pesticide analysis is described. A plug sampler was modified by placing a 9.1 kg lead collar around the axle inside of the collection drum. A digital counter was attached to register each plug collected. Each plug cutter collected 3.9 cm^3 of soil. Mirex 10:5 was broadcast at a rate of 2.8 kg/ha. Samples were collected (by plug sampler and by traditional large area sampler), frozen, and shipped to the lab where they were thawed, dried and then subsampled for benzene extraction. Gas chromatography was performed on the final sample. Significant differences were not found between or among subsample measurements, indicating that there was no difference in the two collection methods. However, the plug samples were more consistent. Because of ease of operation, consistency, and versatility, this technique is a useful tool in soil-pesticide residue investigations.

80-2757. Weber, F. H.; Rosenberg, F. A. (Biol. Dep. Northeastern Univ., Boston, MA 02115) **Biological stability of toxaphene in estuarine sediment.** *Bull. Environ. Contam. Toxicol.* 25(1): 85-89; 1980 (16 references).

Studies attempting to isolate microbes capable of metabolizing toxaphene from estuarine sediments are reported. Sediment samples were collected and incubated in growth medium with 100 mg/l toxaphene in sterilized and unsterilized systems. At intervals of 0, 2, 4 and 8 days, 10 ml aliquots of treatment and control samples were removed and analyzed for toxaphene content. After this experiment, bacteria were isolated and incubated with toxaphene. Sterilized samples showed no reduction in toxaphene, while unsterilized samples showed a decrease in toxaphene with time. The isolates, however, did not significantly alter the concentration of toxaphene with time. No organisms capable of using toxaphene as a carbon source were detected.

80-2758. Scheele, B. (Kernforschungsanlage Juelich, Projekttraeger Umweltchemikalien, D-5170 Juelich, BRD) **Reference chemicals as aids in evaluating a research programme - selection aims and criteria.** *Chemosphere* 9(5-6): 293-309; 1980 (7 references).

An environmental testing program for the Federal Republic of Germany is outlined. The model is designed to provide information on several aspects of ecotoxicology for legislative purposes. The program includes establishment of a list of reference chemicals which can be used to compare the scope of particular methods, the reliability and accuracy of independent methods, and the universality of results from methods where one or more environmental media are used as well as to compare other chemicals with respect to environmental significance. The chemicals were chosen as reference chemicals, not as model chemicals, to allow uniform testing of environmental parameters with the same chemicals. The program is designed to provide established criteria for each of the reference chemicals and in the future for new chemicals. Pesticides selected as reference chemicals include hexachlorobenzene, DDT, DDD (TDE), DDE, PCP, atrazine, 2,4-D and 2,4,5-T. Reasons for selection of each reference chemical are given in detail.

80-2759. Nigg, H. N.; Stamper, J. H. (Agric. Res. & Educ. Cent., Univ. Florida, IFAS, Lake Alfred, FL 33850) **Persistence of phenthoate (cidial) and phenthoate oxon on fruit, leaf and soil surfaces and in air in Florida citrus.** *Chemosphere* 9(5-6): 343-350; 1980 (8 references).

The environmental behavior of phenthoate and phenthoate oxon during cool, dry weather and hot, wet weather in Florida were examined. Air, citrus leaves, fruit, and soil samples were collected, processed, extracted, and examined by gas-liquid chromatography. Residue values, not corrected for recoveries, were plotted against time on a ln-ln basis. It is concluded that the rate of disappearance of phenthoate was not dependent upon initial concentration. The rate of disappearance from plant tissue or soil surfaces is critical in determining worker reentry levels. The rate of disappearance of phenthoate was 1.2 ± 0.01 for the cool and dry weather and was 1.9 ± 0.1 for the hot and wet weather. Comparison of this experiment with data collected from a similar study in California (hot and dry weather) indicates that temperature has the most influence on the disappearance of phenthoate from leaf surfaces. It is suggested that higher temperatures accelerate oxon formation and disappearance.

80-2760. Majka, J. T. (Washington State Univ., Pullman, WA 99163) **The fate of 2,4-D and 2,4,5-T *n*-butyl esters applied at massive rates to three soils.** *Diss. Abstr. Int. B* 41(1): 119; 1980.

Research was conducted to study the degradation, dissipation, and leaching of 50:50 mixture of the her-

bicides, 2,4-D and 2,4,5-T *n*-butyl esters in soils selected from Washington, Wyoming, and Mississippi, under both laboratory and field conditions in Washington state. During the 197 day laboratory incubation of soils receiving the mixture of herbicide esters at dosages ranging from 1 to 10,000 ppmw, it was found that 2,4-D was more susceptible to degradation than 2,4,5-T, that the soil from Mississippi had a lower capacity to degrade either 2,4-D or 2,4,5-T than the soil from Washington, and that degradation of 2,4-D or 2,4,5-T in either soil was dosage dependent. Beyond a certain critical dosage (1 ppmw from the soil from Mississippi and 1000 ppmw for the soil from Washington), the ability of the soil to degrade either herbicide virtually disappeared. Analysis of surface soils from field mini-lysimeters treated with the mixture of 2,4-D and 2,4,5-T *n*-butyl esters at a rate of 560 or 2800 kg/ha of each chemical, during a 20 to 28 mo sampling period indicated that both compounds were significantly dissipated in the soils from Washington and Wyoming at the 560 kg/ha rate. Dissipation was severely restricted when the application rate was increased five-fold. Soil thin layer chromatography indicated that the acid and anionic forms of 2,4-D and 2,4,5-T were mobile in soil, but the corresponding *n*-butyl esters of these herbicides were immobile. Analysis of leachate collected at 30 cm depth in each treated lysimeter disclosed 2,4-D and 2,4,5-T leaching from all three soils at concentrations ranging from 0.002 to 53 ppmw. After two over-wintering periods, herbicide concentrations in the leachates from the 560 kg/ha plots decreased markedly, though concentrations in leachates from the 2800 kg/ha plots remained fairly constant. After 20 to 28 mo 2,4-D and 2,4,5-T residues present in the lysimeter soil profile in the 2800 kg/ha plots were significantly greater than those present in plots treated at the 560 kg/ha rate. (Author abstract by permission, abridged. Copies of the thesis are available from University Microfilms, order No. 8015154)

80-2761. Awasthi, M. D.; Misra, S. S.; Lal, L. (Div. Agric. Chem., IARI, New Delhi, India) **Degradation of aldicarb residues in potatoes.** *Entomon* 4(4): 351-355; 1979 (5 references).

Aldicarb was applied in granular form at rates of 2.0, 3.0, and 4.0 kg AI/ha in 1976-1977 and at rates of 1.0, 2.0, 3.0, 4.0, and 5.0 kg AI/ha in 1977-1978 at planting time. Aldicarb residues were 0.55, 0.90, and 1.20 ppm in raw tubers of potatoes following the 2, 3, and 4 kg AI/ha treatments, respectively, 90 days after treatment. In tubers stored for 1 mo, residues were reduced by 62.5-100%, well below limits set by EPA. Peeling raw potatoes caused a 63-65% loss of aldicarb residues. Boiling followed by peeling removed 94-100% of the residues. After the 1977-1978 applications, residues at harvest ranged from 0.45 to 1.82 ppm for treatments of 1.0-5.0 kg AI/ha. The dissipation rates followed the same trend in the reduction of residues as noted earlier. Tubers stored for 60 days had no detectable residues. The majority of aldicarb residues were in the potato skins.

80-2762. Casida, J. E. (Pestic. Chem. & Toxicol. Lab., Dep. Entomol. Sci., Univ. California, Berkeley, CA 94720) **Pyrethrum flowers and pyrethroid insecticides.** *Environ. Health Perspect.* 34: 189-202; 1980 (6 references).

The chemistry of the pyrethrins is reviewed. Five pyrethroids are highly insecticidal but are not persistent enough for practical agricultural use: allethrin, tetramethrin, resmethrin, phenothrin, and kadethrin. These chemicals are unstable due to their susceptibility to photooxidation at allyl, isobutenyl, furan and thiolactone substituents. Four pyrethroids are currently being used for crop protection: permethrin, cypermethrin, decamethrin, and fenvalerate. Enhanced stability of the pyrethroids was achieved through the addition of a synergist or antioxidant to retard metabolic or photochemical oxidative reactions, or through the replacement of substituents on the molecule which are susceptible to photooxidation. Some of these altered pyrethroids are of environmental concern as their new halogen moieties make the compounds highly liposoluble, almost insoluble in water, and persistant on surfaces due to low vapor pressure. Pyrethroids are not expected to reach a high level of biological magnification through the food chains. They are nearly immobile in soil; adverse effects on soil microorganisms have not been reported. While pyrethroids are nerve poisons, their mode of action at the molecular level is not clear.

80-2763. Anonymous **Hothouse heat.** *FDA Consumer* 14(5): 30-30; 1980.

Lettuce grown in greenhouses may be treated with endosulfan. However, there is a good chance that the crop thus raised will contain higher levels of pesticide residue than field grown crops. This higher residue level may be due to lack of breezes, air circulation and other climatic conditions which are tightly controlled in greenhouse gardening.

80-2764. Ballschmiter, K.; Zell, M. (Abt. Anal. Chem., Univ. Ulm, D-7900 Ulm-Donau, BRD) **Baseline studies of the global pollution. I. Occurrence of organohalogens in pristine European and Antarctic aquatic environments.** *Int. J. Environ. Anal. Chem.* 8(1): 15-35; 1980 (29 references).

Baseline levels of organohalogen airborne contaminants were determined in the spawn of Arctic chars *Salvelinus alpinus* from pristine Alpian lakes, in livers of Antarctic cod off the coast of South Georgia, and in Peru fish oil and crude sperm oil. Gas-liquid chromatograms were obtained, and pollutants were identified by matching high-resolution retention indices of unknowns with those of reference compounds. For *S. alpinus*, residue levels found in ng/g of total lipid extract were 40 for α-BHC, 4.1 for β-BHC, 17.2 for γ-BHC (lindane), 65 for hex-

achlorobenzene, 59 for *p,p'*-DDT, 477 for *p,p'*-DDE, 646 for total DDT, 1030 for PCB, and 124 for polychlorocamphene (PCC). For *D. eleginodes*, residue levels found in mg/g of total lipid extract were 0.1 for α-BHC, 0.1 for β-BHC, 0.1 for γ-BHC, 8 for hexachlorobenzene, 4 for *p,p'*-DDT, 4 for *p,p'*-DDE, 11.4 for total DDT, 32 for PCB and 68 for PCC. These findings indicate a complex contamination of the ecosphere with organochlorine compounds and suggest the need for further baseline studies in other global locations.

80-2765. Rosenberg, A.; Alexander, M. (Lab. Soil. Microbiol., Dep. Agron., Cornell Univ., Ithaca, NY 14853) **2,4,5-Trichlorophenoxyacetic acid (2,4,5-T) decomposition in tropical soil and its cometabolism by bacteria *in vitro*.** *J. Agric. Food Chem.* 28(4): 705-709; 1980 (19 references).

Little loss of unlabeled 2,4,5-trichlorophenoxyacetic acid (2,4,5-T) was evident in four tropical soils in the first 2 mo after addition of the herbicide, but the rate of disappearance then increased with time. Little disappearance was evident in 4 mo in γ-irradiated soil. The production of $^{14}CO_2$ from ^{14}C-ring-labeled 2,4,5-T was detected in 1 wk in two tropical soils, but 2 mo was required for significant $^{14}CO_2$ production in two other tropical soils. Of 52 bacteria isolated from soil and sewage, 41 metabolized 2,4-dichlorophenoxyacetic acid (2,4-D) and often, 2,4,5-T, but none grew by using the herbicides as carbon sources. The cometabolism of 2,4,5-T by these isolates led to chloride release, formation of phenolic products, or cleavage of the aromatic ring. (Author abstract reprinted by permission of the American Chemical Society)

80-2766. Newsome, W. H.; Shields, J. B. (Food Res. Div., Bur. Chem. Saf., Food Dir., Health Prot. Branch, Health & Welfare Canada, Ottawa, Ontario K1A 0L2, Canada) **Residues of rotenone and rotenolone on lettuce and tomato fruit after treatment in the field with rotenone formulations.** *J. Agric. Food Chem.* 28(4): 722-724; 1980 (5 references).

Rotenone and 6aβ,12aβ-rotenolone levels were studied as a function of time on lettuce and tomato crops treated with dust or wettable powder formulations, according to label instructions. On both crops, the dust resulted in higher levels of residue. On lettuce, the half-life of rotenone applied as a dust or wettable powder was 2.9 or 3.6 days, respectively. The corresponding half-life of rotenolone was 4.5 or 5.0 days, respectively. Fourteen days after treatment 0.2-0.3 ppm of rotenone persisted, while 0.2 ppm of rotenolone was found after 9 days. The half-life of rotenone on tomato fruit was 2.7 days for the dust and 0.9 days for wettable powder formulations. Six days after treatment with dust, 0.2 ppm of rotenone was found on tomatoes, while 0.06 ppm of rotenolone was present after 2 days. Both rotenone and rotenolone were stable to boiling in tomato homogenate. (Author abstract reprinted by permission of the American Chemical Society)

80-2767. Bingham, S. W.; Shaver, R. L.; Guyton, C. L. (Dep. Plant Pathol. & Physiol., Virginia Polytech. Inst. & State Univ., Blacksburg, VA 24061) **Peanut uptake and metabolism of ^{14}C oxadiazon from soil.** *J. Agric. Food Chem.* 28(4): 735-740; 1980 (13 references).

Peanuts were planted in 25 cm diameter pots, and [^{14}C] oxadiazon was mixed into the surface 0.64 cm of the soil. Cotyledons contained about 0.27 ppmw oxadiazon equivalent at 30 days after planting, while hypocotyls had a 0.10 ppmw concentration. After 61 days, pegs and immature nuts which were in direct contact with [^{14}C] oxadiazon treated soil contained the highest concentration of herbicide. Hulls contained about 1 ppmw oxadiazon equivalent after 131 days (similar to a field commercial harvest); however, nuts accumulated only about 0.12 ppmw. The total peanut plant had an average of 0.59 ppmw oxadiazon equivalent at maturity. Hulls were found to have at least three ^{14}C-labeled compounds other than [^{14}C] oxadiazon. All other plant parts contained some [^{14}C] oxadiazon, but degradation products were below the level of detection, using TLC and autoradiography. (Author abstract reprinted by permission of the American Chemical Society)

80-2768. Sullivan, R. G.; Knoche, H. W.*; Markle, J. C. (Lab. Agric. Biochem., Univ. Nebraska, Lincoln, NE 68583) **Photolysis of trifluralin: characterization of azobenzene and azoxybenzene photodegradation products.** *J. Agric. Food Chem.* 28(4): 746-755; 1980 (21 references).

Three azoxybenzene derivatives, *N*-propyl-2,2'-azoxybis(α,α, α-trifluoro-6- nitro-*p*- toluidine) (I), 2,2'-azoxybis(α, α,α-trifluoro- 6-nitro-*N*-propyl- *p*-toluidine) (II), and 2,2'-azoxybis(α, α,α-trifluoro-6-nitro-*p*-toluidine (V), and two azobenzene derivatives, *N*-propyl-2,2'-azobis(α,α,α-trifluoro-6-nitro- *p*- toluidine) (III) and 2,2'-azobis(α, α,α-trifluoro- 6-nitro-*N*-propyl- *p*-toluidine) (IV), have been identified as products from UV photolysis of trifluralin in benzene solutions. Purification of individual products was performed by column and thin layer chromatography. Infrared, nuclear magnetic resonance, and mass spectral data of these products are presented and discussed. Chemical reduction of the azoxybenzene I yielded numerous products, including the corresponding azobenzene III and hydrazo derivative [1,2-bis(α,α, α-trifluoro-2- amino-3-nitrotolyl) hydrazine]. Also II was reduced to IV. This work confirms and extends other workers' indications that azoxybenzene derivatives are formed by the photolysis of trifluralin and demonstrates the formation of azobenzenes. (Author abstract reprinted by permission of the American Chemical Society)

80-2769. Lesage, S. (Wastewater Technol. Cent., Canada Cent. Inland Waters, Burlington, Ontario L7R 4A6, Canada) **Reduction of the formation of**

ethylenethiourea from ethylenebis(dithiocarbamates) by cupric ions in aqueous media. *J. Agric. Food Chem.* 28(4): 787-790; 1980 (17 references).

The formation of ethylenethiourea by the thermal degradation of ethylenebis(dithiocarbamates) in aqueous media was greatly reduced by the addition of copper salts. The evolution of CS_2 and the decomposition of either nabam or maneb were decreased in the presence of $CuSO_4$ and Copper-Count-N. The formation of a stable cupric ethylenebis(dithiocarbamate) complex is postulated as the reason for this effect. (Author abstract reprinted by permission of the American Chemical Society)

80-2770. Mayfield, R. J.; O'Loughlin, G. J. (Div. Textile Ind., CSIRO, Belmont, Victoria 3216, Australia) **Evaluation of decamethrin as an insectproofing agent for wool.** *J. Agric. Food Chem.* 28(4): 886-887; 1980 (10 references).

The application of decamethrin to wool by exhaustion from a dye bath and the durability of the treatment have been investigated. Significant loss of the pyrethroid from the wool occurred on prolonged boiling in the dye bath. The fastness to washing and dry-cleaning of decamethrin was similar to that of permethrin, but its light stability was much lower. Decamethrin was at least six times more active than permethrin to *Tinea metonella*, but exhibited similar activity to *Anthrenus flavipes*. Decamethrin is less cost-effective than permethrin for the insectproofing of wool. (Author abstract reprinted by permission of the American Chemical Society)

80-2771. Scorgie, H. R. A. (Inst. Terrest. Ecol., Monks Wood Exp. Stn., Huntingdon PE17, 2LS, England) **Ecological effects of the aquatic herbicide cyanatryne on a drainage channel.** *J. Appl. Ecol.* 17(1): 207-225; 1980 (20 references).

The long term effects of the herbicide cyanatryne on a fresh water ecosystem were investigated. A drainage channel was divided into sections by polythene barriers and one section was treated with cyanatryne until a 0.2 μg/g concentration was reached. Monthly water samples were taken from inorganic analysis; weekly measurements of temperature, pH, conductivity and dissolved oxygen were made; and samples were examined for cyanatryne residues on days 1, 3, 7, 14, 21, 28, 42, 79, 91, 119, and 155. The aquatic vegetation was mapped monthly, samples for identification of invertebrates were collected monthly, and the periphyton community was examined weekly by observing glass slide colonization. Cyanatryne residues reached a peak of 0.12 μg/g in the treated section more than 3 mo after treatment. After 12 wk, plants were eradicated from the treated section. Examination of the periphyton slides showed that the same species colonized the slides in all sections; however, the total number of organisms increased more rapidly in the treated section. In the treated section, the invertebrate community associated with *Myriophyllum spicatum* (the most commonly occurring macrophyte before treatment) was replaced by one more typical of detritus. Numbers of invertebrates did not change markedly, but many species declined. Plants began to recolonize the treated section 1 yr after treatment, and the invertebrates associated with these plants gradually reappeared.

80-2772. Haith, D. A. (Dep. Agric. Eng., Cornell Univ., Ithaca, NY 14853) **A mathematical model for estimating pesticide losses in runoff.** *J. Environ. Qual.* 9(3): 428-433; 1980 (26 references).

A simple mathematical model has been proposed for the estimation of losses of dissolved and solid-phase pesticide in cropland runoff. The model is designed for use in water quality and pesticides screening studies for which field pesticide runoff data are unavailable. Hence, the model is based on commonly used methods for runoff and soil loss predictions and does not require calibration. A comparison of model predictions with measured atrazine (2-chloro-4(ethylamino) -6-(isopropylamino) -*s*-triazine) losses from 2 small Georgia watersheds has indicated that the model provides a reasonable means of estimating the approximate magnitudes of long-term (3 yr for the 2 watersheds) total pesticide runoff losses. Although large errors were sometimes observed in estimates of losses from single runoff events, the observed variations in pesticide losses among events and the distribution of these losses into dissolved and solid-phase components were reflected in model predictions. (Author abstract by permission)

80-2773. Wu, T. L. (Smithsonian Inst., Edgewater, MD 21037) **Dissipation of the herbicides atrazine and alachlor in a Maryland corn field.** *J. Environ. Qual.* 9(3): 459-465; 1980 (20 references).

Atrazine and alachlor are commonly used in Maryland corn fields (*Zea mays* L), primarily as preemergence herbicides. This research was part of a watershed program designed to monitor nonpoint source pollution due to runoff of chemicals from agricultural lands. Atrazine and alachlor were sprayed on a corn field at rates of 1.7 kg/ha and 2.3 kg/ha, respectively. Soil cores were taken from sites at 4 elevations in the field. At the highest elevation, atrazine underwent a decrease in the surface 5 cm layer, but a fraction of atrazine was leached into the deeper soil profile. At the middle altitude atrazine concentrations in the 2.5-30 cm soil profile changed very little during the growing season. At the lowest elevation, where solid moisture was rather high, atrazine had an even distribution in the soil profile. Thus, the data on field soil indicated both downward and lateral movement of atrazine. Alachlor remained in the top 8 cm of the solid. Low leachability of

alachlor in field soil is believed to result from a strong affinity of alachlor molecules for soil organic matter. Runoff losses were detected at a weir situated near the bottom of the drainage channel of the watershed. During the 1976 growing season, 17 g/ha of atrazine and 3.6 g/ha of alachlor were discharged. About 60% of the discharged herbicides were in the dissolved phase. Flow weighted mean herbicide concentrations in the runoff water were 16.9 μg/l (atrazine) and 0.06 μg/l (alachlor). Atrazine carryover detected in the corn field soils was generally from 0.09 to 0.56 μg/g. Between 5 and 13% of the atrazine applied to the fields was estimated to be carried over to the next growing season. (Author abstract by permission)

80-2774. Junk, G. A.; Spalding, R. F.; Richard, J. J. (Ames Lab., USDOE, Iowa State Univ., Ames, IA 50011) **Areal, vertical, and temporal differences in ground water chemistry: II. Organic constituents.** *J. Environ. Qual.* 9(3): 479-483; 1980 (17 references).

Selected organic components in samples collected from monitoring wells and from surface water are shown to follow definite areal, vertical, and temporal trends in concentration. Atrazine, alachlor, and dieldrin were measured in 64, 35 and 35 water samples, respectively. The atrazine amounts ranged from < 0.01 to 88 μg/l. Peak concentrations were observed in shallow well water down gradient from irrigated fields at the end of the irrigation season. The areal and vertical distribution of atrazine are closely associated with those of nitrate-nitrogen (NO_3-N), which was measured as an indicator of deep percolation from irrigated croplands. However, temporal variations in atrazine concentrations suggest that it is a non-conservative constituent of ground water. Alachlor and dieldrin amounts were extremely low, being less than 0.1 μg/l in all but one water sample which was taken from a well located in an excessively well-drained area. Dissolved organic carbon (DOC) was measured in 95 water samples and the amounts ranged from 0.2 to 4.8 mg/l. Maximums occurred in shallow wells and there were no seasonal associations with either atrazine or NO_3-N. The DOC data suggest percolation from the unsaturated zone and partial removal from solution during vertical transport within the saturated zone. (Author abstract by permission)

80-2775. Bracewell, L. W.; Selleck, R. E.; Carter, R. (Swanson Oswald Assoc., San Francisco, CA) **Contribution of wastewater discharges to ocean surface particulates.** *J. Water Pollut. Control Fed.* 52(8): 2230-2245; 1980 (15 references).

The impact of wastewater effluents, which contain chlorinated compounds, heavy metals, pesticides, proteinaceous material, particulates and microorganisms, discharged into the marine environment on the surface microlayer of coastal waters was investigated. A 500 μ mesh screen was used to sample ocean surface layers, 3 cm deep × 0.87 wide, at approximately 0.8-1.33 m/sec. The screen was removed, stored in a Petri dish under refrigeration, and later analyzed for total dry wt, hexane-extractable materials (HEM), and coliform bacteria. The composition of the HEM was further analyzed for fatty acids, PCBs, and pesticides. PCBs and pesticides were separated from the HEM by an activated silica column and were then measured quantitatively by electron capture gas-liquid chromatography. PCB in one HEM sample was 0.13%; in all other samples PCBs were below the limit of detection. Pesticides, if present, were below the limit of detection, less than 0.10%. Pesticide residues were not determined on non-extractable samples.

80-2776. Streibig, J. C. (Dep. Crop Husband. & Plant Breed., R. Vet. & Agric. Univ., Copenhagen, Denmark) **Measured and predicted concentration of *s*-triazine in soil water.** *K. Vet. Landbohoejsk. Arsskr.*: pp. 47-56; 1980 (14 references).

Six different soil types were used in experiments designed to compare the predicted concentrations of *s*-triazine in soil-water with those obtained experimentally. Ring-labelled ^{14}C-atrazine or simazine (5 μCi/mg) was mixed with soil in pots which also contained porous ceramic cups. The *s*-triazine concentrations used approximated the GR50-values (dose required to reduce dry matter production of oats by 50%) of the respective soils. Incubation was carried out in growth chambers at field water capacity. Soil-water samples were collected by applying suction to the ceramic cups, and were analyzed with a liquid scintillation counter. The predicted soil water concentration of *s*-triazine, which was computed on dosage, partition coefficient, and water content of the soil, was compared with the measured concentration. Results indicated, in general, that the predicted concentration was somewhat greater than the measured one, and that the partition coefficient played the most important role in predicting soil-water *s*-triazine concentration. Some possible explanations for the differences between predicted and measured concentrations are given. It was determined that about 100 μg/l simazine in soil-water reduced growth by 50%, while the measured concentration of atrazine was only 62% of the predicted 92 μg/l.

80-2777. Holm, T. R.; Anderson, M. A.; Stanforth, R. R.; Iverson, D. G. (Water Chem. Program, Univ. Wisconsin, Madison, WI 53706) **Influence of adsorption on the rates of microbial degradation of arsenic species in sediments.** *Limnol. Oceanogr.* 25(1): 23-30; 1980 (16 references).

A model is presented which describes the rates of transformation of adsorbable species in heterogeneous systems, and it is applied to arsenic species. The assump-

tions made in modeling rates of species transformations are given, along with justification for each assumption. A simple numerical method for kinetic computations in complex systems is also described. Four cases of species transformations influenced by adsorption are considered along with sample computations using parameters for adsorption of arsenic species on river sediments. Finally, the model was tested against experimental results in which anaerobic river sediments were incubated with methanearsonic acid. Samples were taken at 1, 3, 10, 19, 37, and 65 days, and arsenic was determined by flameless atomic absorption spectrophotometry. Good agreement was seen between the model predictions and the experimental data.

80-2778. Tu, C. M. (Res. Inst., Agric. Canada, London, Ontario N6A 5B7, Canada) **Influence of five pyrethroid insecticides on microbial populations and activities in soil.** *Microb. Ecol.* 5(4): 321-328; 1980 (18 references).

Permethrin and 4 other pyrethroid insecticides (FMC 45498, Shell WL 41706, Shell WL 43467, and Shell WL 43775) were applied at 0.5 and 5 μg/g to sandy loam soil to assess the effects on microbial populations. Soils treated with carbofuran, maneb, chlorpyrifos, nitrapyrin (a nitrogen stabilizer) and streptomycin were examined for comparative purposes. Antimicrobial activity was observed in the early stages of incubation with the pesticides with population numbers returning to normal by 2-4 wk. Microbial growth stimulation by the insecticides was observed to some extent in the later stages of the experiments. While no effect was found on the acetylene-reducing ability of the soil incubates, an increase in nitrification was found after 4 wk in the WL 43467-treated soil at both concentrations and in the soils treated with permethrin and WL 4706 at the 5 μg/g levels. Soil microbial respiration increased with increasing insecticide concentrations suggesting degradation of the insecticides by soil microbes. Measurements of dehydrogenase activity indicated that none of the insecticides caused an inhibition of formazan formation. Most of the insecticides increased urease activity of the soil. These findings point to the transient and usually reversible effects of the pyrethroid insecticides on microflora of a sandy loam soil.

80-2779. Szokolay, A.; Uhmak, J.; Sackmauerova, M. (Res. Inst. Prevent. Med., Bratislava, Czechoslovakia) **Influence of culinary processes on terminal residues of chlorinated pesticides and vitamin E in poultry meat.** *Mitt. Geb. Lebensmittelunters. Hyg.* 71(2): 253-259; 1980 (18 references).

Samples of fat, roasted and fried poultry were analyzed for residues of BHC isomers and HCB (hexachlorobenzene). The chemicals were added to animal feed at rates of 1 and 50 mg/kg fodder. PCP occurred in meat samples fortified with HCB and γ-BHC (lindane). 2,4,6-TCP was found only in samples from animals fed HCB. Concentrations of terminal residues of HCB and BHC isomers in general declined as well as the concentrations of most metabolites and degradation products after thermal processing. Vitamin E losses were measured in roasted meat. The losses of vitamin E were greater from meat contaminated with pesticides than from meat of control animals.

80-2780. Smelt, J. H.; Dekker, A.; Leistra, M. (Lab. Res. Insectic., NL-6709 PG Wageningen, The Netherlands) **Effect of soil moisture condition on the conversion rate of oxamyl.** *Neth. J. Agric. Sci.* 27(3): 191-198; 1979 (11 references).

Studies were designed to determine the rate of conversion of the insecticide oxamyl to compounds with low activity in four different soils under six different moisture conditions. In addition, soil moisture contents were related to soil moisture pressure. Moisture pressures of the soils were read from porous-cup tensiometers with mercury manometers, and moisture content was determined by the membrane press method. Soil samples of varying moisture content (0.03 to 0.36 kg/kg) were incubated with oxamyl at 15°C for up to 140 days. At various intervals, the soil samples were extracted with acetone, and oxamyl determined by gas chromatography. In soils with moisture pressures of about -9.8×10^3 Pa, half-lives of oxamyl were 13 days in clay loam, 14 days in loamy sand, 34 days in peaty sand, and 39 days in humic loamy sand. The conversion rate gradually decreased when moisture content was lowered to values at about wilting. At moisture contents far below the wilting point, the conversion rate further decreased with clay loam, but increased sharply with humic loamy sand.

80-2781. Anonymous **DDT products ravage Alabama wildlife.** *New Sci.* 87(1214): 523; 1980.

Very high levels of DDT and its degradation products were found in Alabama nearly 10 yr after a chemical plant, which had produced DDT for 24 yr, ceased operations. The effluent from the factory was carried by a ditch directly into a stream in the Wheeler National Wildlife Refuge. The estimated amount of total DDT present in the refuge is 4×10^6 kg. Mallard duck, cottontail rabbit and swamp rabbit muscle samples were collected from the refuge and were found to contain levels of DDT and its degradation products which exceeded established tolerance limits in 37 of the 50 samples. Fish-eating birds using the refuge have declined in numbers, probably due to the deleterious effects DDT has as it is magnified in the food chain. In ducks contaminated with DDT during the winter, reproductive success was noted to be decreased.

80-2782. Fujii, Y.; Kurozumi, A.; Misato, T. (Ageo Res. Lab., Agrochem. Div., Nippon Kayaku Co. Ltd.,

Saitama 362, Japan) **Photodecomposition of 3,3′-dimethyl-4-methoxybenzophenone (methoxyphenone, NK 049) and its photosensitizing activity.** *Nippon Noyaku Gakkaishi (J. Pestic. Sci.)* 4(4): 487-496; 1979 (27 references).

When the herbicide ^{14}C-methoxyphenone (NK-049) in aqueous solutions was exposed to UV light, rapid decomposition occurred via cleavage of the carbonyl group. Stepwise oxidations of the 3- or 3′-methyl group, reduction of the carbonyl group, and demethylation of the 4-OCH_3 group were also observed. Similar pathways of degradation were found when NK-049 was exposed to sunlight while on glass or silica gel plates. Ten of the sixteen NK-049 photodecomposition products detected by thin layer chromatography were identified. Little difference was found between those photodecomposition products obtained by sunlight and those resulting after UV irradiation. The photosensitizing properties of NK-049 were similar to those of benzophenone. In the presence of NK-049, dieldrin was rapidly converted to intramolecule bridged photodieldrin when exposed to sunlight.

80-2783. Fine, D. H. (New England Inst. Life Sci., Waltham, MA) **Exposure assessment to preformed environmental *N*-nitroso compounds from the point of view of our own studies.** *Oncology* 37(4): 199-202; 1980 (23 references).

Amine salt and dinitroaniline herbicides contain *N*-nitrosamine contaminants. Since these contaminants have been found, successful reduction of these contaminants has been achieved by the manufacturers. Thus in the dimethylamine salt of 2,3,6-trichlorobenzoic acid, the *N*-nitrosodimethylamine levels were reduced from 640 μg/ml to less than 2 μg/ml. Similar reductions were made in the *N*-nitrosodipropylamine concentration in trifluralin herbicides, cutting the contaminant from 195 to less than 1 μg/ml. When trifluralin was applied to a tomato field, no *N*-nitrosodipropylamine was found in the soil, runoff water, or in the air above the field.

80-2784. van Tiel, N. (Plant Prot. Serv., Wageningen, The Netherlands) **Activities of FAO/WHO Codex Alimentarius Commission in the field of pesticide residues.** *Outlook Agric.* 10(3): 130-134; 1979 (8 references).

Some activities of the FAO/WHO Codex Alimentarius Commission, established in 1963 to draw up internationally acceptable standards for foods, including levels of pesticide residues, are reported. An organizational chart showing the Commission in relation to various international agencies is presented. The main function of the Commission is to reach agreement on internationally acceptable maximum limits for pesticide residues in food commodities moving in international trade. The maximum residue levels for animal feed are also being considered. In addition, basic principles of good agricultural practice and pesticide use have been developed. The maximum residue limits and acceptable daily intakes are determined for various pesticides, and their compatibility critically examined. Member countries have ample opportunity to comment on proposals and recommendations. Working Groups on sampling and on methods of analysis have also been active. The impact of the Commission is growing, with 44 member countries, compared with 16 initially. Increasingly, countries which have not yet developed pesticide regulations are adopting the proposals emerging from the Commission.

80-2785. Leahey, J. P. (ICI Plant Prot. Div., Jealott's Hill Res. Stn., Bracknell, Berks, England) **The metabolism and environmental degradation of the pyrethroid insecticides.** *Outlook Agric.* 10(3): 135-135; 1979 (60 references).

In this review, knowledge on the degradation process of pyrethroid insecticides in the environment is summarized. The structures of natural pyrethrins, photolabile synthetic pyrethroids, and photostabilized synthetic pyrethroids are given. The natural pyrethrins have been shown to be rapidly degraded in the environment by sunlight, and they are also readily metabolized by living organisms. Their routes of metabolism are mainly oxidative, with virtually no degradation via hydrolysis of the ester linkage to the secondary pyrethrolone alcohol. Studies of the photolabile synthetic pyrethroids have been limited, since their photo-instability precludes their use as agricultural insecticides. However, the complex metabolic pathways that have been elucidated are described. The discovery of photostabilized synthetic pyrethroids, including permethrin, cypermethrin, decamethrin, and fenvalerate, enabled their use as agricultural pesticides. Their degradation has been studied in a wide variety of biological and environmental systems (insects, rats, mice, cows, goats, chickens, isolated enzymes, plants, soil, and sunlight). Routes of metabolism in the various systems are detailed.

80-2786. Graham-Bryce, I. J.; Nicholls, P. H.; Williams, I. H. (Insectic. & Fungic. Dep., Rothamsted Exp. Stn., Harpenden, Herts AL5 2JQ, England) **Performance and uptake of some carbendazim-producing fungicides applied as seed treatment to spring barley, in relation to their physicochemical properties.** *Pestic. Sci.* 11(1): 1-8; 1980 (21 references).

The performance of carbendazim and its chemical precursors benomyl, thiophanate-methyl and methyl 4-(2-aminophenyl) -3-thioallophanate (I; NF48) as systemic fungicidal seed treatments on barleys was investigated. In field trials all treatments significantly decreased smut *(Ustilago nuda)* at 3.2 g/kg of seed; the order of effectiveness was I > benomyl > thiophanate-methyl > carbendazim. Control of barley mildew *(Erysiphe graminis)*

followed a similar pattern but results were less clear-cut. Measurements of uptake and translocation from seeds, treated with radiolabelled fungicide and planted in pots of Woburn soil in a controlled environment room, showed that seedlings accumulated much more I than the other compounds over 28 days. This substanital early uptake into leaves could explain why I was particularly effective against smut in the field trials. Comparisons of amounts taken up, with solubility in water, octanol/water partition coefficient, extent of adsorption on soil and p*Ka* values suggested that the effects of these properties on availability in the soil solution may be more important than their influence on penetration into the root in determining relative uptake and disease control in the case of localized applications such as seed treatments. (Author abstract by permission)

80-2787. Cayley, G. R.; Hike, G. A. (Rothamsted Exp. Stn., Harpenden, Herts AL5 2JQ, England) **Uptake of iprodione and control of diseases on potato stems.** *Pestic. Sci.* 11(1): 15-19; 1980 (11 references).

When applied to the roots of potato plants growing in different soils iprodione became systemic in the plants. Although iprodione was adsorbed on the soils tested, sufficient fungicide was present in potato stems to prevent infection by *Phoma exigua* var. *foveata* on all plants except those grown in peat soils. The amounts of fungicide present in the aerial parts of the plant was related to the soil/water distribution coefficients. Application of iprodione to the sprouts of seed potato tubers prior to planting decreased the incidence and severity of infection by *Rhizoctonia solani* (stem canker) and *Polyscytalum pustulans* on stem bases. (Author abstract by permission)

80-2788. Dobbs, A. J.; Grant, C. (Build. Res. Establ., Princes Risborough Lab., Princes Risborough, Aylesbury, Bucks HP17 9PX, England) **Pesticide volatilisation rates: a new measurement of the vapour pressure of pentachlorophenol at room temperature.** *Pestic. Sci.* 11(1): 29-32; 1980 (5 references).

The rates of volatilization of pentachlorophenol (PCP), α-HCH (α-BHC, lindane) and HEOD (dieldrin) have been measured under the same conditions. The rates found indicate that the vapor pressure of pentachlorophenol at ambient temperatures is $\cong 10^{-6}$ mm Hg, significantly lower than the widely quoted value $\cong 10^{-4}$ mm Hg. This lower value accounts for the behavior of pentachlorophenol better than the existing value, which was obtained by extrapolation of the results of high temperature experiments. It is suggested that the direct measurement of relative loss rates is a simpler method of measuring volatile loss than the measurement of vapor pressure and that the method may prove a useful alternative to vapor pressure measurements in the assessment of the environmental effects of chemicals, particularly for compounds of moderate volatility. (Author abstract by permission)

80-2789. Bengston, M.; Connell, M.; Davies, R. A. H.; Desmarchelier, J. M.; Elder, W. B.; Hart, R. J.; Phillips, M. P.; Ridley, E. G.; Ripp, B. E.; Snelson, J. T.; Sticka, R. (Dep. Primary Ind., Indooroopilly, Brisbane 4068, Australia) **Chlorpyrifos-methyl plus bioresmethrin; methacrifos; pirimiphos-methyl plus bioresmethrin; and synergised bioresmethrin as grain protectants for wheat.** *Pestic. Sci.* 11(1): 61-76; 1980 (10 references).

Emulsifiable concentrate formulations of various grain protectants were diluted with water and sprayed into the grain stream at the rate of 1 *l*/ton during turning of bulk wheat from one bin to another. Storage temperatures ranged from 25 to 32°C and relative humidity from 55 to 70%. The order of persistence of the protectants was bioresmethrin > chlorpyrifos-methyl > methacrifos. Methacrifos residues were constantly higher in the aerated than in the non-aerated bin. The agreement of residue values among the different analysts was good. Variation from the mean ranged from 3% for pirimiphos-methyl to 8% for chlorpyrifos-methyl. All residue levels were below proposed international levels.

80-2790. Barug, D.; Vonk, J. W. (Inst. Org. Chem., TNO, 3522 AD Utrecht, The Netherlands) **Studies on the degradation of bis(tributyltin) oxide in soil.** *Pestic. Sci.* 11(1): 77-82; 1980 (13 references).

The degradation of bis(tri[1-^{14}C]butyltin) oxide in two soils (1 mg tin/kg) has been studied under laboratory conditions. Half of the applied compound disappeared from unsterilized silt loam and sandy loam in approximately 15 and 20 wk, respectively; it disappeared also from the sterilized soils but to a lesser extent. The formation of small amounts of dibutyltin derivatives was established by thin-layer chromatography both in the unsterilized and sterile soils. The amount of unextractable radioactivity increased with time in the unsterilized and sterile soils. In the unsterilized soils ^{14}C was released as [^{14}C]carbon dioxide in amounts equivalent to 20% of the applied radioactivity for silt loam and 10.7% for sandy loam over a period of 42 wk. Almost no [^{14}C]carbon dioxide was released from the sterile soils, confirming microbial participation in the degradation of the compound in the unsterilized soils. (Author abstract by permission)

80-2791. Rouchaud, J.; Moons, C.; Meyers, J. A. (Lab. Phytopathol., Univ. Cathol. Louvain, 1348 Louvain-la-Neuve, Belgium) **Distribution of the radioactivity in sugar beet plants treated with ^{14}C aldicarb.** *Pestic. Sci.* 11(1): 83-89; 1980 (9 references).

Sugar beet plants were grown in the field, after in-furrow application of [^{14}C]aldicarb (3 kg of aldicarb/ha) at

planting. Some plants (the growing plants) were harvested 99 days after sowing and the rest (the ripe plants) 196 days after sowing. The percentages of the weights of [^{14}C]aldicarb equivalents (the total aldicarb plus aldicarb sulfoxide and sulfone, plus all the other metabolites of [^{14}C]aldicarb which contain ^{14}C, expressed as aldicarb equivalents) incorporated into the beet plants, relative to the weight applied to the soil, were 2.8 and 1.8, respectively for the growing and ripe plants. The concentrations of [^{14}C]aldicarb equivalents (mg/kg fresh weight) in the growing and ripe plants, respectively were: blades of the external leaves, 3.16 and 0.93; blades of the internal leaves, 0.63 and 0.68; petioles of the external leaves, 0.51 and 0.26; petioles of the internal leaves, 0.15 and 0.05; crowns, 0.14 and 0.15; roots, 0.16 and 0.13. The proportions of the extractable aldicarb plus aldicarb sulfoxide and aldicarb sulfone determined by gas-liquid chromatography (expressed as aldicarb equivalents) relative to [^{14}C]aldicarb equivalents, in the external and internal leaf blades of the growing beets, were 56 and 60%, respectively; these values declined to 25 and 19%, respectively in the ripe plants. The proportion was 21% or less in all other parts of the growing and ripe plants. (Author abstract by permission)

80-2792. Hashemy-Tonkabony, S. E.; Mosstofian, B. (Res. Lab., Dep. Food Hyg., Univ. Tehran, Tehran, Iran) **Chlorinated pesticide residues in chicken egg.** *Poult. Sci.* 58(6): 1432-1434; 1979 (13 references).

Two hundred and twenty-one representative samples of chicken eggs of native and commercial strains of *Gallus domesticus* were collected during January 1975 to August 1977 throughout the Tehran area and the Northern province of Mazandarane. The samples were analyzed for chlorinated pesticide residues by gas-liquid chromatography. The insecticides, DDT, TDE, DDE, isomers of BHC, aldrin/dieldrin, heptachlor/heptachlor epoxide, dieldrin, and endrin were detected in varying concentrations in the eggs. The eggs of native bred chickens, mainly as a result of their food sources, showed greater concentrations of all pesticides except BHC isomers than those of commercial types. Though concentration of DDT compounds in 22% of native bred and 5% of commercial eggs exceeded WHO tolerance limit, the mean concentrations of pesticides residues were not exceeding these limits. There was no correlation between concentration of pesticides and egg shell thinning. (Author abstract by permission)

80-2793. Mac, M. J.; Nicholson, L. W.; McCauley, C. A. (Great Lakes Fish. Lab., US Fish & Wildlife Serv., Ann Arbor, MI 48105) **PCBs and DDE in commercial fish feeds.** *Prog. Fish Cult.* 41(4): 210-211; 1979 (6 references).

Levels of PCB and *p,p'*-DDE were determined in 3 commercial fish feeds by gas liquid chromatography (GLC). Feed samples were saponified in alcoholic potassium hydroxide for 0.5 hr, and extracted with hexane before cleanup on florisil or silica gel columns. Results of GLC analyses showed PCB levels ranging from 0.10 to 0.30 μg/g and DDE levels from 0.01 to 0.47 μg/g in Oregon Moist Pellets. In Silver Cup, PCB concentrations were from 0.06 to 0.07 μg/g and DDE levels ranged from 0.01 to 0.06 μg/g. Brine shrimp *(Artemia salina)* nauplii had PCB residues of 0.14 μg/g and DDE levels of 0.03 μg/g. It is suggested that the presence of organic contaminants in commercial fish feeds be considered when these products are used in the diets of fish involved in contaminant-exposure experiments.

80-2794. Eckenfelder, W. W., Jr. (Vanderbilt Univ., Nashville, TN 37235) **Recent developments and future trends in industrial wastewater technology.** *Pure Appl. Chem.* 52(8): 1973-1983; 1980 (14 references).

The major influence in recent years in wastewater treatment has moved toward the removal of pollutants such as toxic organics. Many of the priority pollutants currently are removed from water by the activated sludge process. Removal is brought about by three mechanisms, stripping, adsorption to the biological floc, or biological degradation. Recent improvements have led to the development of powdered activated carbon applied to the activated sludge process (PAC). Trials have been conducted comparing each method in the removal of contaminants from chemical industries wastewater. Improvement was noted with the PAC system in the overall variability in the effluent COD and suspended solids. Enhancement of nitrification in industrial wastewaters using PAC has been demonstrated. Using the activated sludge process the effluent concentration of chlorinated, organosulfur, and organophosphate insecticides was 0.35, 15.0 and 3.03 mg/l, respectively. Using the PACT method the same figures were reduced to 0.17, 0 and 1.23 mg/l.

80-2795. Bellinck, C.; Mayaudon, J. (Lab. Ecol. Microbienne, Univ. Louvain, B-1348 Louvain la Neuve, Belgium) **Decomposition du Phenmediphame ^{14}C et de l'Atrazine ^{14}C dans le sol; immobilisation dans le sol et absorption par les plantes de ces herbicides ^{14}C et de leurs residus ^{14}C. [Decomposition of ^{14} phenmedipham and ^{14}C atrazine in soil; immobilization in soil and absorption by plants of ^{14}C herbicides and ^{14}C residues.]** *Rev. Ecol. Biol. Sol* 16(4): 465-476; 1979 (23 references) (French).

Degradation of phenmedipham and atrazine in soil is a biological process which in both cases includes dealkylation, separation of the aromatic ring between two carbamoyl bonds, and slow decomposition of the second benzene ring. Phytotoxicity of the herbicides is reduced by hydroxylation in position two but persists upon dealkylation. In soil, atrazine is converted to deethylated atrazine as a major phytotoxic metabolite and di*iso*propylated atrazine as the minor phytotoxic metabolite. Mineraliza-

tion proceeds faster at low atrazine and phenmedipham concentrations in the soil. Absorption of ^{14}C-phenmedipham and its labeled metabolites by soil constituents was found to be partly biological. ^{14}C-Atrazine and its labeled metabolites were adsorbed on a chemical basis. Higher application levels resulted in an attenuation of complex formation. Exposed and radicular plant parts of wheat, oat and corn incubated for 1 yr with 10 or 100 ppm ^{14}C-labeled phenmedipham or atrazine contained radiolabel.

80-2796. Mestres, R.; Duboul-Razavet, C.; Cooper, J. F. (Lab. Chim. Appl. Expert., Fac. Pharm., Montpellier, France) **Contamination par les diphenyles chlores et les residus de pesticides organochlores des sediments marins du golfe d'Aigues-Mortes. [PCB and chlorinated pesticide residues in marine sediments from the Bay of Aigues-Mortes.]** *Trav. Soc. Pharm. Montpellier* 40(1): 1-8; 1980 (2 references) (French).

Sediment samples were collected in 1975 from an area approximately 20 km wide and 40 km long in the Bay of Aigiues-Mortes at depths from 9 to 37 km. They were analyzed by methods used in a similar study conducted in 1972. When the sediment was analyzed, PCBs were ubiquitous, with a mean value of 0.23 ppm (range 0.12-0.78) in wet sediment. The levels at the various sampling sites were similar to those previously obtained, indicating high stability of the deposit. Aldrin was detected in sediment from one site at 0.14 ppm (wet basis), although the possibility of accidental sample contamination could not be excluded. Dieldrin did not accompany the aldrin because of the strong reducing properties of the sediment. Heptachlor and heptachlor epoxide were detected in one-fourth of the samples collected in 1972, but were not found in 1975. No DDT was detected in 1975, but DDE was recorded at 0.005-0.1 ppm. Traces of lindane were observed in 47% of the samples, with a mean level of 10 ppb, and traces of α-BHC were present in 38% of the samples. Thus organochlorine levels have decreased since the use of these compounds in agriculture was prohibited in 1972.

80-2797. Hirota, R.; Fujiki, M.; Tajima, S. (Aitsu Mar. Biol. Stn., Kumamoto Univ., Kumamoto, Japan) **Accumulation of mercury by fish from contaminated sediments.** *US EPA Rep.* EPA 600/3-79-102: pp. 225-240; 1979.

The relationship between body length and mercury concentration in fish is not known for fish that inhabit areas of the sea bottom sediments containing mercury. Fish captured from Minamata Bay where there is a great deal of mercury pollution and uncontaminated fish grown in pens in Minamata Bay were studied to determine if there was a correlation between accumulation of mercury in fish flesh and rearing time in Minamata Bay. The correlation coefficients (r) between the concentration of accumulated mercury and body length were 0.676 for common seabass, 0.65 for marbled rockfish, 0.63 for jack mackeral, 0.61 for black sea bream, and 0.35 for rockfish. These are considered statistically significant. Correlation coefficients of 0.3 for red sea bream, 0.096 for the common nibbler, and -0.06 for mullet were not statistically significant. Fish were separated into four groups and reared in pens at two stations in Minamata Bay. The tendency for mercury accumulation in the fish from the different experimental groups was different for each species. From the results it appears that selected species and ages of fish should be used when a mercury monitoring program is implemented in Minamata Bay. (Author abstract by permission)

80-2798. Bremer, K. E. (US EPA, Chicago, IL 60604) **PCB contamination of the Sheboygan River, Indiana Harbor, and Saginaw River and Bay.** *US EPA Rep.* EPA 600/3-79-102: pp. 261-288; 1979 (6 references).

Current PCB contamination in three harbor areas of the Great Lakes has resulted in problems related to maintenance dredging, disposal, or fish contamination. The Sheboygan River shows high PCB residues in fish and bottom sediments as a result of improper PCB disposal. Indiana Harbor, one of the most highly contaminated harbors in the Great Lakes is experiencing delays in maintenance dredging of approximately 750,000 cubic yards of bottom sediment. High concentrations of mercury, lead, zinc, manganese, arsenic, and PCBs have been detected throughout the harbor and ship canal. A new dike disposal area has been completed in Saginaw Bay. Possible use of this confined disposal site will be made for PCB-contaminated sediments from the Saginaw River. (Author abstract by permission)

80-2799. Thomas, T. J.; Brown, D. P.; Harrington, J.; Stanford, T.; Taft, L. (Battelle Columbus Lab., Columbus, OH) **Land based environmental monitoring at Johnston Island - disposal of Herbicide Orange.** *US NTIS AD Rep.* AD-A076,025/6: 340 pp.; 1978 (43 references).

As part of the US Air Force final environmental impact statement of incineration of Herbicide Orange (2,4-D and 2,4,5-T) from Johnston Island, the Air Force stated that a monitoring program would be conducted to demonstrate that the land-based transfer operations were carried out in an environmentally safe manner. Battelle Columbus Laboratories conducted these monitoring programs on Johnston Island. The monitoring of at-sea incineration operations were conducted by TRW and have been reported elsewhere. Concentrations of 2,4-D and 2,4,5-T found in the ambient air and water samples were minimal. No TCDD was detected in any air or water samples. No changes that could be attributed to the operations were noted in indigenous plant or bird populations. Results of quality control sampling revealed that the required level of drum cleaning was achieved. Industrial

hygiene evaluations of the land-based operations revealed that only minor accidents or injuries occurred and exposure of workers to airborne 2,4-D and 2,4,5-T were well below permissible levels. No adverse consequences of the minimal release of Herbicide Orange into the Johnston Atoll environment were observed. (Author abstract by permission)

80-2800. Rosenberg, A.; Lieberman, M. T.; Alexander, M. (Dep. Agron., Cornell Univ., Ithaca, NY 14853) **Microbial degradation of pesticides.** *US NTIS AD Rep.* AD-A078,456/1: 50 pp.; 1979 (19 references).

The toxicity and degradation of pesticides introduced into sanitary sewer facilities has yet to be extensively studied. For this reason, the effect and fate of eight pesticides were investigated using the BOD method with a sewage inoculum. Six of the 8 chemicals (carbaryl, malathion, diazinon, Dursban (chlorpyrifos), dichlorvos, and 2,4-D) did not retard oxygen consumption by a 0.33% sewage inoculum in a 1 wk test period at concentrations ranging from 0.1 to 100 μg/ml of AI. Baygon (propoxur) at 10 and 100 μg/ml was toxic in the test period. Ficam (bendiocarb) at 1 and 10 μg/ml also slowed oxygen consumption during the decomposition of sewage as compared to a control with no pesticide. The BOD method was used to test the biodegradation of the pesticides with each chemical being used as a sole carbon source for an adapted or unadapted inoculum. Carbaryl was readily degraded, and malathion and diazinon also appeared to undergo oxidation, although the reaction was incomplete. Dichlorvos, Baygon, and 2,4-D were resistant to breakdown when tested by the BOD method. (Author abstract by permission)

80-2801. Harrison, D. D.; Miller, C. I.; Crews, R. C. (Armament Lab., US Air Force, Eglin AFB, FL) **Residual levels of 2,3,7,8-tetrachlorodibenzo-*p*-dioxin (TCDD) near herbicide storage and loading areas at Eglin AFB, Florida.** *US NTIS AD Rep.* AD-A078,819/0: 34 pp.; 1979 (9 references).

A study was made of the residual levels of 2,3,7,8-tetrachlorodibenzo-*p*-dioxin (TCDD) in the areas surrounding 3 hardstands on Eglin AFB, Florida, that had been previously used for storing and loading military herbicides. The study deals only with areas in the immediate vicinity of these hardstands and their associated drainage systems. Massive quantities of herbicides, including Herbicide Orange (2,4-D and 2,4,5-T), were loaded at these hardstands between 1972 and 1970. Only one of the 3 storage and loading areas was found to be contaminated with TCDD. Hardstand 8 and the east end of Taxiway 9 were relatively free of TCDD residues in the soil. Soil from around Hardstand 7, the most intensively used hardstand, still has concentrations of TCDD as high as 275 ppb, however. Concentrations of one-third that amount were present to a depth of 1 m at 2 sampling sites. Soil contamination around Hardstand 7 is confined to a small area immediately surrounding the concrete pad. A map of TCDD soil concentrations is presented. (Author abstract by permission)

80-2802. Perry, J. J. (Dep. Microbiol., North Carolina State Univ., Raleigh, NC) **The role of co-oxidation and commensalism in the biodegradation of recalcitrant molecules.** *US NTIS AD Rep. AD-A080,845:* 24 pp.; 1979 (26 references).

Studies were performed on the cooxidation of various substrates, including malathion, propylene, cyclohexane, PCBs, and terpenes. The enzymes involved in cooxidation and commensalistic relationships whereby the products of an organism are utilized by another were investigated. (Author abstract by permission)

80-2803. Bell, M. A.; Ewing, R. A.; Lutz, G. A. (Battelle Columbus Lab., Columbus, OH) **Reviews of the environmental effects of pollutants. XII. Hexachlorocyclopentadiene.** *US NTIS PB Rep.* PB-122,963: 94 pp.; 1978 (111 references).

The document is a review of the scientific literature on the biological and environmental effects of hexachlorocyclopentadiene (HCPD). Included in the review are a general summary and a comprehensive discussion of the following topics as related to HCPD and specific HCPD compounds: physical and chemical properties; occurrence; synthesis and use; analytical methodology; biological aspects in microorganisms, plants, wild and domestic animals, and humans; distribution mobility, and persistence in the environment; and an assessment of present and potential health and environmental hazards. The document also contains an evaluation of potential hazard resulting from HCPD contamination in the environment and suggests current research needs. (Author abstract by permission)

80-2804. Hoehn, R. C.; Randall, C. W. (Dep. Civil Eng., Virginia Polytech. Inst. & State Univ., Blacksburg, VA 24061) **Viruses, organics, and other health-related constituents of the Occoquan watershed and water-service area. Part. I. Trihalomethanes, pesticides, and metals.** *US NTIS PB* Rep. PB-121,023: 185 pp.; 1979 (22 references).

This study reports data from a 2 yr monitoring effort (1975-1977) for several health-related constituents of drinking water in a northern Virginia system (Fairfax County Water Authority) which serves about 640,000 residents. Metals and pesticides were monitored for 1 year, whereas the trihalomethanes (THM's) were monitored for 2. A principal focus of the report is on the temporal variations observed for THM concentrations. Possible causes for these variations are explored in detail. The approach

and findings should be useful to scientists and engineers who either are attempting to interpret national studies based on limited sampling from several systems or are planning to design and execute investigations similar to the one described in the report. (Author abstract by permission)

80-2805. Hern, S. C.; Lambou, V. M.; Tai, H. (Environ. Monitor. & Support Lab., Office Res. & Dev., US EPA, Las Vegas, NV 89114) **Pesticides and polychlorinated biphenyls in the Atchafalaya Basin, Louisiana.** *US NTIS PB Rep.* PB-144,835: 89 pp.; 1979 (16 references).

The collection and analysis of samples for pesticides and polychlorinated biphenyls (PCBs) were included in the Atchafalaya River Basin Water and Land Study. From 1974 to 1977, 743 samples were collected from 118 stations in the Atchafalaya Basin. Water, bottom sediment, and fish samples were analyzed for 9 organophosphorus compounds and 18 organochlorine compounds. No organophosphorus compounds were detected in any fish, water or bottom sediment samples. Only a few organochlorine compounds, aldrin, dieldrin, PCBs, chlordane, and DDT and its derivatives, are present in bottom sediments of the Atchafalaya Basin. With the exception of PCBs none of the compounds was detected in water samples. Aldrin, dieldrin, PCBs, and DDT and its derivatives were found in fish samples. The pattern of pesticides distribution that emerges in the Atchafalaya Basin reflects the agricultural activity within or affecting the various hydrological units of the Basin. (Author abstract by permission)

80-2806. Crews, W. B. (Univ. California Davis, Davis, CA 95616) **Static and dynamic transport models of lead and DDT.** *US NTIS PB Rep.* PB-147,648: 59 pp.; 1980 (67 references).

Research is reported on development of models and simulation of global transport dynamics of pollutants, specifically lead and DDT. A corollary objective is the use of these models as tools for decision makers to achieve realistic policies concerning contamination of the ecosphere. Two lead models were constructed: the Urban Aerosol Model which interprets seasonal variance in lead aerosol levels over cities; and the Northern Hemisphere Model which is designed to be consistent with estimates of global lead transport. A global DDT model is a primitive compartmental model with transfer rates between compartments proportional to the amount of contaminant in the donor compartment. Inputs include agricultural and natural denudation of lead from soils and annual production of lead. The model's compartments are land, atmosphere, runoff, and seas. Transfer coefficients between compartments are consistent with authoritative estimates. The DDT model is a simple linear compartmental design. Input is global production of DDT and outputs are estimated amounts of pesticides stored in the atmosphere, land, and seas. Results of the research and simulations may imitate quite closely dynamics of real systems. Possible future trends and levels are estimated for various sectors of the ecosphere. (Author abstract by permission)

80-2807. Ben-Aryeh, H.; Gutman, D. (Dep. Oral & Maxillo-Facial Surg., Lab. Oral Biol., Rambam Med. Cent., Haifa, Israel) **Saliva for biological monitoring.** In: *The Use of Biological Specimens for the Assessment of Human Exposure to Environmental Pollutants.* Berlin, A., Wolff, A. H. and Hasegawa, Y., eds. (Martinus Nijhoff: The Hague): pp. 65-69; 1979 (24 references).

Saliva is recommended for use in the biological monitoring of both organic and inorganic environmental pollutants. Before its use as a body fluid for biological monitoring is fully accepted, normal salivary levels of various chemicals in the healthy population must be determined. Relationships between salivary and blood serum and plasma levels must be established. Saliva may also be used as an indicator of systemic and physiological conditions. Drugs affecting the normal operation of the salivary glands need to be considered. Methods for the collection of human saliva and analytical procedures for the determination of environmental pollutants in saliva are presented. Techniques for overcoming variability in concentrations of chemicals being monitored with change in salivary secretion rates are discussed. Listed among the compounds which cause hypersalivation are alkylphosphates (parathion), mercury, nicotine, strychnine, tabun and thallium.

80-2808. Clarkson, T. W.; Greenwood, M. R. (Dep. Radiat. Biol. & Biophys., Sch. Med., Univ. Rochester, Rochester, NY) **Mercury, biological specimen collections.** In: *The Use of Biological Specimens for the Assessment of Human to Exposure Environmental Pollutants.* Berlin, A., Wolff, A. H. and Hasegawa, Y., eds. (Martinus Nijhoff: The Hague): pp. 109-119; 1979 (12 references).

For evaluating human exposure to metallic mercury vapor, samples of blood or urine are the specimens of choice. Both may be easily collected and transported, however, they are not usually suitable for long term storage. Questions have been raised about using blood or urinary levels of mercury to represent mercury concentrations in the critical organ following exposure to mercury vapor. In the case of methylmercury, mercury levels in whole blood or red cells are usually a good indication of the concentration of mercury in the critical organ in both steady and non-steady state exposures. Hair samples may be stored for long periods of time and are usually good indicators of past exposure to methylmercury. Average hair to blood ratios of methylmercury are about 300. Since individuals vary a great deal, blood and hair determinations for each subject are recommended. When the mother of a

suckling infant has had extensive exposure to methylmercury, it may be necessary to monitor concentrations of this compound in the milk.

80-2809. Commoner, B.; Vithayathil, A. (Cent. Biol. Nat. Syst., Washington Univ., Saint Louis, MO) **The analysis of urine samples as a means of detecting exposure to environmental organic carcinogens.** In: *The Use of Biological Specimens for the Assessment of Human Exposur to Environmental Pollutants.* Berlin, A., Wolff, A. H. and Hasegawa, Y., eds. (Martinus Nijhoff: The Hague): pp. 121-138; 1979 (11 references).

The possibility of collecting and storing urine samples to determine relative body burdens of various organic environmental pollutants and for detecting carcinogenic and mutagenic compounds was investigated. When a carcinogenic substance is isolated from the urine it is assumed that the precursor of that metabolite is likely to act as a carcinogen in the individual. The ability to handle numerous samples will be necessary in implementing a biological monitoring program using urine specimens. Long-term animal tests for the detection of carcinogens are often impractical. Bacterial mutagenesis tests such as the Ames *Salmonella typhimurium* test for mutagenicity are more practical for analysis of carcinogenicity of urinary metabolites. An overview of the carcinogenicity of synthetic organic environmental pollutants is given. The amounts of man-made carcinogenic pollutants in air, water and industrial wastes are likely to increase in the future. Analytical procedures used in the *Salmonella typhimurium* system of carcinogenicity screening are discussed. Some organizational recommendations, sample collection and storage methods, and economic considerations for the analysis of environmental pollutants in urine are presented. Tables and figures are given from studies on urinary metabolites from human and animals and from environmental samples that have caused mutagenesis or carcinogenesis in various test systems.

80-2810. Egan, H. (Lab. Gov. Chem., London, England) **Organic and inorganic compounds: analytical aspects.** In: *The Use of Biological Specimens for the Assessment of Human Exposure to Environmental Pollutants.* Berlin, A., Wolff, A. H. and Hasegawa, Y., eds. (Martinus Nijhoff: The Hague): pp. 139-146; 1979 (22 references).

Analyses for organic and inorganic environmental pollutants in human populations often involves working with trace quantities. The physiological effects of environmental pollutants determines largely which type of specimen will need to be collected. While blood and urine samples may be suitable for detecting residues of the heavy metals, subcutaneous fat samples may be analyzed for residues of the organochlorine pesticides and PCB. In some instances the route of exposure will influence the type of specimen to be monitored. Thin layer and gas liquid chromatography are commonly used for detection of dieldrin, BHC, DDT and hexachlorobenzene residues in human adipose tissue. PCB compounds are generally of interest due to their interference in analyses of the organochlorine insecticides. Detection limits for most organochlorine pesticides are in the area of 0.05 mg/kg for TLC methods and 0.001 mg/kg for GLC techniques. Organophosphorus pesticide residues in humans generally have slightly better detection limits of 0.003 mg/kg while detection limits of triazine and chlorophenoxy compounds fall between 0.01 and 0.1 mg/kg. Studies on storage of samples for organochlorine and organophosphorus pesticide residues analyses in humans indicate that stability is affected by temperature, substrate, and length of storage. Analytical and sample storage techniques are also discussed for the biological monitoring of nitrosamines, vinyl chloride, antibiotics, synthetic hormones, mycotoxins, asbestos, trace metals, and polynuclear aromatic and other hydrocarbons.

80-2811. Farvar, M. T. (Vice-Rector Environ. Sci., Bu-Ali Sina Univ., Hamadan, Iran) **Collection of human biological specimens in developing countries for monitoring organochlorine compounds.** *In: The Use of Biological Specimens for the Assessment of Human Exposure to Environmental Pollutants.* Berlin, A., Wolff, A. H. and Hasegawa, Y., eds. (Martinus Nijhoff: The Hague): pp. 155-163; 1979 (22 references).

The current knowledge on the problems connected with the collection and storage of human biological specimens in developing countries for examining organochlorine exposure is presented. Studies designed to evaluate the prevalence of exposure to organochlorine and evaluate their effect on human health are presented. An intensive examination of the problem of DDT residues in human milk is given. Other organochlorine compounds found in human milk samples from developing countries are DDE, hexachlorobenzene, PCB, and BHC. The possible deleterious effects of these compounds on the developing infant was of main concern. Methods for sampling, storage and analysis of organochlorine residues in human tissues are reviewed. Tables of studies from the literature reporting organochlorine residues in human milk samples from developing countries are also given.

80-2812. Greve, P. A. (Lab. Toxicol., Natl. Inst. Public Health, Bilthoven, The Netherlands) **Monitoring of human samples for organochlorine pesticides and related compounds.** In: *The Use of Biological Specimens for the Assessment of Human Exposure to Environmental Pollutants. Berlin, A., Wolff, A. H. and Hasegana, Y., eds. (Martinus Nijoff: The Hague):* pp. 177-190; 1979 (107 references).

Past and present research on the monitoring of human samples for organochlorine pesticides and related

compounds often is very variable in scope and methods of analysis. Three tables are presented which attempt to summarize relevant work on organochlorine residues in human milk, blood and adipose tissues for the period of 1973-1976. Compounds representing the highest residues detected are β-BHC, *p,p'*-DDE and PCB. Specimen collection and storage are briefly mentioned for living persons and autopsy specimens. The frequency of sampling and medical and occupational history required for a general idea of residue trends in a population are discussed. The most reliable analytical techniques for determining various organochlorine pesticide residues are examined.

80-2813. Kaloyanova, F.; Benchev, I.; Georgiev, G.; Izmirova, N.; Risov, N. (Inst. Hyg. & Occup. Dis., Sofia, Bulgaria) **Pesticides and persistent substances - biological specimen collection.** In: *The Use of Biological Specimens for the Assessment of Human Exposure to Environmental Pollutants.* Berlin, A., Wolff, A. H. and Hasegawa, Y., eds. (Martinus Nijoff: The Hague): pp. 177-190; 1979 (107

Guidelines are presented for monitoring exposure of human populations to persistent oranochlorine pesticides and PCB. A program design for monitoring exposure of a human population to organophosphorus or carbamate pesticides by measurement of cholinesterase activity is also outlined. The organochlorine pesticides and PCB residues in the environment are of major concern because of their resistance to biodegradation and their ability for bioaccumulation. Some sampling and sample preparation techniques for these compounds in blood and adipose tissue are examined. Gas-liquid chromatography and mass spectrophotometry have been the major analysis methods employed for PCB and organochlorine residue determinations, but little progress has been made in international standardization of analysis methods for these substances. It is suggested that results for organochlorines and PCB in fat be expressed on a hexane extractable lipid basis and for blood on a whole blood basis. Intralaboratory checks and interlaboratory studies are recommended for standardization and quality control. Directives for population selection and recording a subject's background information are offered. Organizational, ethical, legal, and economic considerations are also recommended.

80-2814. Korte, F. (Inst. Chem., Tech. Univ. Munich, D-8050 Freising-Weihenstephen, BRD) **Organic compounds.** In: *The Use of Biological Specimens for the Assessment of Human Exposure to Environmental Pollutants.* Berlin, A., Wolff, A. H. and Hasegawa, Y., eds. (Martinus Nijhoff: The Hague): pp. 247-265; 1979.

The benefits of a national specimen collection, analysis and storage program for the biological monitoring of environmental pollutants are discussed. Gas chromatography and mass spectroscopy using multichannel mass-fragmentation analysis are recommended as the methods for large-scale centralized organic pesticide residue determinations. Computerization of data on subject backgrounds would be needed to indicate residue trends in human populations. Analyses should be carried out on eye, liver, fat, kidney, brain and muscle tissue from animals and humans. Plant samples will also be utilized in residue studies to integrate representative data on human diet. Organochlorine residues have been found in numerous environmental samples such as maize, eggs, and tree needles. A suggested program for such a centralized monitoring system which was modeled after the specimen bank program at the Institute of Ecological Chemistry is presented. Results of actual analyses done on environmental samples and on controlled samples from feeding experiments are given. Laboratory experiments demonstrated differences in residue levels of some organic compounds due to type of chemical, species, and sex. Numerous figures and tables summarizing data from residue studies of organic pollutants are also included.

80-2815. Kutz, F.; Strassman, S.; Yobs, A. (Ecol. Monitoring Branch, US EPA, Washington DC) **Survey of pesticide residues and their metabolites in the general population of the United States.** In: *The Use of Biological Specimens for the Assessment of Human Exposure to Environmental Pollutants.* Berlin, A., Wolff, A. H. and Hasegawa, Y., eds. (Martinus Nijhoff: The Hague): pp. 267-274; 1979 (12 references).

Indications of residue distributions of environmental pollutants may be found in various body fluids and tissues from the general population of the United States. In annual national studies, PCB and certain organochlorine insecticides such as DDT, BHC, aldrin, heptachlor, endrin, oxychlordane, mirex, *trans*-nonachlor and hexachlorobenzene and some metabolites have been detected in adipose tissue samples taken from the general US population. Determinations of pesticide residues in blood serum and milk samples from selected Arkansas and Mississippi counties revealed similar residue levels of these compounds. Recent technology has allowed the detection of organophosphorus, carbamate, and organochlorine insecticides, and certain phenoxy herbicides in human urine. Preliminary investigations on urine samples from the general population have indicated the presence of residues of some of these compounds.

80-2816. Ordonez, B. R. (Sec. Public Health & Welfare, Mexico City, Mexico) **Specific working paper on pesticides.** In: *The Use of Biological Specimens for the Assessment of Human Exposure to Environmental Pollutants.* Berlin, A., Wolff, A. H., and Hasegawa, Y., eds. (Martinus Nijhoff: The Hague): pp. 295-301; 1979.

Organochlorine and organophosphorus pesticides are widely used in many countries. Bioaccumulation of the

organochlorine pesticides may be found in human adipose tissue. Monitoring of biological residues of these compounds is of vital importance. Numerous studies of pesticide residues in blood and body tissues have been conducted. Over 40 studies on pesticide residues in human milk are already in the literature. Shipment of human milk samples from Latin America for monitoring of environmental pollutants requires freezing of the specimens. Problems involved in population sampling and collection of specimens are discussed along with methods of surveying for donor data. Special problems connected with biological monitoring of pesticides in rural districts of Latin America are mentioned. The benefits of a centralized system for storage, analysis and data processing for the biological monitoring of environmental pollutants in Latin America are stressed. In developing countries, strict regulations are imposed for obtaining specimens from postmortem samples for biological monitoring, but less stringent requirements are set when obtaining specimens from living human donors. Costs for sample collection are low when compared to developed nations but laboratory expenses are greater. In Mexico and the United States one sample for biological monitoring would cost from about $159-164, and for one sample for future reference about $40-45.

80-2817. Schmidt-Bleek, F.; Muhs, P. (Fed. Environ. Agency, Umweltbundesamt, D-100 Berlin 33, BRD) **Conceptual design of an environmental specimen bank in the Federal Republic of Germany.** In: *The Use of Biological Specimens for the Assessment of Human Exposure to Environmental Pollutants.* Berlin, A., Wolff, A. H. and Hasegawa, Y., eds. (Martinus Nijhoff: The Hague): pp. 313-324; 1979.

The main reasons for the need for an environmental specimen bank (ESB) in West Germany are summarized. An ESB would give up to date information on the spread of man-made chemicals in the environment and through human populations. It would permit extrapolations of residue trends in the environment to man, to determine possible threats to health. An ESB would allow the storage of specimens for analysis at a later date if questions or new technologies should necessitate reexamination of a particular pollutant residue. The most important function of the ESB would be to keep track of the organic pollutants and their degradation products. Focus in monitoring studies in the past has been on DDT, Hg, Cd, and the polycyclic hydrocarbons. The principle parts of an integrated ESB are presented. Areas of ESB operation requiring further research are mentioned.

80-2818. Zielhuis, R. L. (Coronel Lab., Univ. Amsterdam, Amsterdam, The Netherlands) **General aspects of biological monitoring.** In: *The Use of Biological Specimens for the Assessment of Human Exposure to Environmental Pollutants.* Berlin, A., Wolff, A. H. and Hasegawa, Y., eds. (Martinus Nijhoff: The Hague): pp. 341-359; 1979.

This working paper summarizes a series of smaller working papers each on a topic relating to biological monitoring (BM). The areas discussed are objectives of BM, BM *vs.* environmental monitoring, limitations of BM, classification of a BM program's immediate objectives, concepts of exposure and dose, exposure-response relationships, classification of external exposure, at risk populations, percentile distribution, parameter validity, BM and standard setting, sample size, and socio-medical aspects. BM is at present limited to only the metabolites of some pollutants such as *p*-nitrophenol in the case of some organophosphorus compounds and DDA and DDE in the case of DDT. Capsule summaries for all of the working papers presented at the workshop are also included in this section.

80-2819. Sharom, M. S.; Miles, J. R. W.; Harris, C. R.; McEwen, F. L. (Crop Prot. Branch, MARDI, Serdang, Selangor, Malaysia) **Persistence of 12 insecticides in water.** *Water Res.* 14(8): 1089-1093; 1980 (24 references).

The persistence of dieldrin, endrin, ethion, leptophos, lindane, chlorpyrifos, diazinon, mevinphos, *p,p'*-DDT, carbaryl, parathion and carbofuran was measured in natural, distilled, sterilized natural and sterilized distilled water. DDT, lindane and parathion were very persistent in all but the natural water samples, indicating the importance of microbial action in their degradation. The organochlorine pesticides exhibited little evidence of any chemical degradation process. Dieldrin, endrin, ethion and leptophos were the four most stable compounds in water. The carbamates and the other organophosphates disappeared readily from water, indicating the significance of chemical processes in their degradation. A secondary role of biological processes was noted in the degradation of chlorpyrifos, diazinon and carbaryl. After 8 wk in natural water the chemicals ranged as follows from most to least persistent: dieldrin, endrin, ethion, leptophos, lindane, chlorpyrifos, diazinon, mevinphos, carbofuran, *p,p'*-DDT, carbaryl, and parathion. To base a prediction of persistence in the environment solely on chemical structure of the compound is concluded not to be justified from these results.

80-2820. Sharom, M. S.; Miles, J. R. W.; Harris, C. R.; McEwen, F. L. (Crop Prot. Branch, MARDI, Serdang, Selangor, Malaysia) **Behaviour of 12 insecticides in soil and aqueous suspensions of soil and sediment.** *Water Res.* 14(8): 1095-1100; 1980 (15 references).

Soil adsorption of DDT, leptophos, dieldrin, endrin, ethion, chlorpyrifos, lindane, parathion, diazinon, carbaryl, carbofuran, and mevinphos was studied using organic soil, stream sediment, Beverly sandy loam, and Planfield sand. The insecticides used were rapidly adsorbed by the soils, but several hr were needed to reach maximum adsorption. Adsorption, desorption and mobility of the in-

secticides in soils and water appeared to depend largely on the nature of the adsorbents and water solubility of the insecticide. The order of adsorption was DDT > leptophos > dieldrin > endrin > ethion > chlorpyrifos > lindane > parathion > diazinon > carbaryl > carbofuran > mevinphos. The greatest adsorptive capacity was demonstrated by the organic soil, followed by stream sediment, Beverly sandy loam and Plainfield sand.

80-2821. Jennings, E. A.; Drennan, D. S. H. (Lilley Res. Cent. Ltd., Erl Wood Manor, Windlesham, Surrey GU20 6PH, England) **Weed control with pre-sowing herbicides in irrigated cotton (*Gossypium barbadense* L) and groundnut (*Arachis hypogaea* L) in Sudan. II. Economic, labor requirement, crop safety and operational aspects of trifluralin and benfluralin.** *Weed Res.* 19(5): 301-306; 1979 (5 references).

Soil incorporated, pre-sowing application of trifluralin in cotton or of benfluralin (benefin) in groundnut, each at 1.68 kg AI/ha, cut labor requirement for handweeding to levels where the tenant could be largely independent of hired labor. Economic returns from a combination of these herbicides plus supportive handweeding for herbicide-resistant species compared favorably with those from handweeding only as presently recommended. Application and incorporation of trifluralin and benfluralin fitted well into existing practices for seedbed preparation and any likely modifications of these. There was no evidence of crop phytotoxicity and crop maturity was not affected. Residue analysis indicated no soil residue problems for crops in rotations and no residues were detected in crop seed. Trifluralin applied many months in advance of cotton planting in the dry season did not start to disappear until the soils were wetted just before cotton planting. (Author abstract by permission)

80-2822. Williams, J. H.; Eagle, D. J. (Agric. Dev. & Advis. Serv., Woodthorne, Wolverhampton WV6 8TQ, England) **Persistence of dichlobenil in a sandy soil and effects of residues on plant growth.** *Weed Res.* 19(5): 315-320; 1979 (4 references).

The persistence of dichlobenil following the application of dichlobenil granules was studied in a replicated plot experiment including both surface and incorporated treatments of 8.3 and 16.6 kg/ha AI. Soil analyses showed initial half-life of about 4 wk but the persistence increased with time and a year after application the half-life was about 1 yr. Incorporation of the granules into the soil markedly increased the persistence of dichlobenil and its metabolite dichlorobenzamide. The most sensitive crop was carrot which was damaged by residues of only 1-2% of the recommended dose. Residues phytotoxic to carrots persisted for 2 yr from the 8.3 kg/ha surface application and 5 yr from the 18.6 kg/ha incorporated application. Lettuce was also highly sensitive to residues. (Author abstract by permission)

80-2823. Fletcher, R. A.; Drexler, D. M.* (Dep. Environ. Biol., Univ. Guelph, Guelph, Ontario N1G 2W1, Canada) **Interactions of diclofop-methyl and 2,4-D in cultivated oats (*Avena sativa*).** *Weed Sci.* 28(4): 363-366; 1980 (6 references).

The chlorophyll levels and growth of oat (*Avenia sativa* L. Elgin) seedlings were drastically reduced after foliar application of diclofop-methyl [methyl 2-[4-(2,4-dichlorophenoxy) phenoxy] propanoate]. The leaves were chlorotic and necrotic, with the newly emerging leaves being most affected. Plants treated with 2,4-D [(2,4-dichlorophenoxy)acetic acid] were similar to the controls. When 2,4-D was applied to intact plants in combination with diclofop-methyl the toxicity symptoms produced by diclofop-methyl were reduced. Diclofop-methyl disrupted membrane integrity and inhibited chlorophyll formation in excised leaf segments. Addition of 2,4-D with diclofop-methyl did not change the effects produced by diclofop-methyl alone in excised leaf segments. (Author abstract by permission)

80-2824. Jarc, H.; Tratnig-Frankl, E. (Bundesanst. Virusseuchenbekaempfung Haustieren, A-1231 Wien, Austria) **Rueckstandsuntersuchungen in Oesterreich. 2. Mitteilng. Untersuchungen ueber Schwermetall-, pestizid- und antibiotikarueckstande in Rindern aus Kaernten. [Studies on residues in Austria. Part 2. Investigations on the heavy metals, pesticides and antibiotics content of cattle from Carinthia.]** *Wien. Tieraerztl. Monatsschr.* 66(10): 297-299; 1979 (21 references).

Antibiotic, pesticide, and heavy metal levels were determined for meat, fat, liver, kidney and spleen of 23 cattle from Carinthia. Gas chromatographic measurement of pesticides indicated levels below legal maximum values. The percentage of samples found to contain pesticide residues were 70-87% for hexachlorobenzene (HCB), 15-83% for α-HCH (α-BHC), 65-78% for γ-HCH (γ-BHC; lindane), 4-35% for DDE, 4% (fat and liver samples only) for DDT and 4% (fat) for dieldrin. Aldrin, heptachlor, endrin and PCNB (quintozene) were not detected in any samples. Median pesticide levels detected were 1.1 (spleen) to 4.9 (fat) ppb hexachlorobenzene, 0.5 (spleen) to 2.3 (fat) ppb α-HCH, 0.8 (liver) to 2.1 (fat) ppb γ-HCH, 0.4 (meat) to 4.4 (fat) ppb DDE, not detectable (meat, kidney and spleen) to 166.0 ppb (fat) DDT, 1.3 ppb (fat) dieldrin, and not detectable for other samples.

See also 80-2704, 80-2708, 80-2745, 80-2746, 80-2825, 80-2826, 80-2837, 80-2843, 80-2844, 80-2848, 80-2849, 80-2850, 80-2853, 80-2856, 80-2859, 80-2969, 80-2972, 80-2986, 80-2996 *and* 80-2998.

80-2825. Bhatla, M. N.; Breidenbach, A. W.; Weston, R. F. (Weston Designers Consultants, West Chester, PA 19380) **Treatability of priority pollutants: status review and case histories.** *AIChE Symp. Ser.* 197(76): 25-30; 1979.

Technology available for removal of priority pollutants from wastewater is reviewed. Most treatment and removal processes are concerned with the removal of the inorganic compounds; limited data on the organic components of wastewater are available. Biological treatment of wastewater including aerobic and anaerobic degradation, column absorption, and activated carbon removal of the pesticides dieldrin, DDT, DDD (TDE), endrin, heptachlor, aldrin, heptachlor epoxide and lindane are discussed. Applications of techniques, including reversible adsorbtion, chemical, photochemical and free-radical oxidation, and physical removal are also investigated.

80-2826. Hwang, S. T.; Fahrenthold, P. (US EPA, Washington, DC) **Treatability of the organic priority pollutants by steam stripping.** *AIChE Symp. Ser.* 197(76): 37-60; 1979 (24 references).

Steam distillation of the 129 priority pollutants was investigated for efficient removal of these priority pollutants from wastewater. Many of these organic pollutants are pesticides. Most priority chemicals can form constant-boiling heterogeneous azeotropes with water. Homogeneous mixtures of some compounds can then be formed after oil-water phase separation due to the differing water solubilities. Removal of these non-ideal solutions can be controlled by vapor-liquid equilibrium compositions in dilute aqueous solutions. From these equilibrium data, activity coefficients were calculated and either interpolated or extrapolated to the optimum temperature for steam stripping. The boiling points of the homogeneous mixtures were between the boiling points of the water solutions and the heterogeneous azeotropes. Wastewater was brought into contact with steam to remove by vaporization one or more of the priority pollutants. After this the vapor was carried through distillation equipment with or without reflux until the pollutant was collected on a tray. The tray efficiencies as well as the thermodynamics of the mixtures were analyzed, the strippability of the chemicals were determined and the results are presented in tabular form.

80-2827. Hayes, A. L.; Wise, R. A.; Weir, F. W. (Univ. Texas Health Sci. Cent., Sch. Public Health, Houston, TX 77025) **Assessment of occupational exposure to organophosphates in pest control operators.** *Am. Ind. Hyg. Assoc. J.* 41(8): 568-575; 1980 (24 references).

An occupational study was conducted for a firm employing 22 pest control operators (PCOs) exposed to three organophosphorus insecticides. Measurements of 8-hr exposure levels were less than: 131.0 $\mu g/m^3$ for Vaponite (dichlorvos); 41.0 $\mu g/m^3$ for diazinon; and 27.6 $\mu g/m^3$ for Dursban (chlorpyrifos). Twenty-four-hr urines analyzed for alkyl phosphates showed the presence of metabolites of these three pesticides. The effect of this exposure is reflected by a statistically significant inhibition of plasma acetylcholinesterase (AChE) among the PCOs as compared to an age and sex-matched control group. There were no significant differences in the mean RBC AChE values of either group. Although physical examinations detected no apparent toxic effects in the study group, biological sampling results indicated a need for personal protective equipment during the handling and application of these pesticides. (Author abstract by permission)

80-2828. Merian, E. (Swiss Soc. Environ. Prot., CH-4106 Therwil, im Kirsgarten, Switzerland) **Legal limits and controls for volatile aromatic hydrocarbons.** *Chemosphere* 9(5-6): N3-N6; 1980 (32 references).

A short review of the maximum allowable concentrations of volatile aromatic hydrocarbons for 6 countries is given. The MAC values given in most tables are for healthy working populations exposed for 8 hr/day for 5 days. Exposure limits for general populations in many countries are in the process of being determined. The relative risks of different types of exposure are being evaluated. MAC values for naphthalene, dichlorobenzene and biphenyl in Germany, Switzerland, Sweden, Hungary, the USSR and the USA are included.

80-2829. Riazanova, R. A.; Platonenko, V. I. (F. F. Erisman Res. Inst. Hyg., Moscow, USSR) **Raschetnyi metod opredeleniia dopustimykh ostatochnykh kolichestv pestitsidov v pishchevykh produktakh. [Calculation of permissible residual amounts of pesticides in food products.]** *Gig. Sanit.* 45(5): 29-30; 1980 (3 references) (Russian).

An equation for estimating permissible residual amounts (PRA) of pesticides in food products is presented. Computer analysis indicates that PRA depend upon the LD50 values but not upon the Lim_{ch} or the K_{cum}. PRA values increased with increased LD50 values. PRA estimates for thiocarbamate and dithiocarbamate pesticides that had not previously been calculated were determined for the first time with this formula. The PRA for eptam (EPTC) is 0.54 mg/kg; for preparation 23, 0.03 mg/kg; for preparation 275, 0.16 mg/kg; and for Diptan, 0.4 mg/kg.

80-2830. Casula, D. (Ist. Med. Lav., Fac. Med. & Chirurgia, Univ. Studi Cagliari, Cagliari, Italy) **Broncopneumopatie croniche non specifiche di origine professionale (con esclusione di quelle natura infettiva ed immuno-allergica e dei tumori dell'apparato respiratorio). [Occupational chronic non-specific bronchopneumonpathies excluding those of infectious or immuno-allergic**

origin or due to tumors of the respiratory tract.] *Ig. Mod.* 73(4): 525-549; 1980 (Italian).

The numerous forms of non-specific occupational bronchopneumopathies are reviewed according to etiology, clinical picture, causative agent, nature of exposure, response to anatomical bronchopulmonary structures and individual susceptibility. Physical agents act only indirectly by weakening resistance, but are not the direct cause, which is almost wholly confined to hundreds of inorganic and organic agents (including various pesticides) and dusts. A study of occupational chronic emphysema in the petrochemical and other industries and in mines accomplished by screening 10,000 workers is discussed. While the incidence of occupational chronic emphysema and asthma is still on the increase, the incidence of pneumoconiosis has been reduced as a result of precautionary measures, which are perceived to be the only means available for the control of all occupational forms of the disease.

80-2831. D'Arca, S. U.; Pana, A.; Mastroeni, I. (Ist. Ig. G. Sanarelli, Univ. Roma, Rome, Italy) **Epidemiologia delle malformazioni congenite. [Epidemiology of congenital malformations.]** *Ig. Mod.* 73(4): 550-552; 1980 (296 references) (Italian).

Statistical data on congenital malformations available from ISTAT for a 20 yr period beginning with 1955-56 were analyzed with respect to demographic variations, major birth defects, sex, ethnic origin, age of parents, etc. The causes of congenital malformations at the developmental level of cells, tissues and organs can be operative for a very short or a very long period. The effect of some pathogenic mechanisms can be traced to the beginning stages of organogenesis, of others to the first weeks of postnatal life. Aside from genetic factors the causative agents include chemical, physical and biological agents as well as changes in maternal metabolism. Teratogenic substances, ionizing radiation, drugs and specific virus infections were identified as causes of congenital malformations. Evidence of embryotoxicity has been found for some insecticides, herbicides, fungicides, heavy metals (Hg, Pb and Se) and PCB's, and is suggested for others. It is estimated that environmental factors are responsible for 7-10% of the malformations. About 60% of the causes are untraceable, and it is suggested that this percentage will not decrease due to the continuing increase of foreign substances in the environment.

80-2832. Tordoir, W. F. (Group Toxicol. Div., Shell Int. Res. Maatschappij B. V., The Hague, The Netherlands) **Field worker exposure during pesticide application. Report of an international workshop in The Hague.** *Int. Arch. Occup. Environ. Health* 46(2): 183-189; 1980 (29 references).

An international workshop on *Field Worker Exposure During Pesticide Application* was held in The Hague from October 9 to 11, 1979. Under the leadership of the Scientific Committee on Pesticides of the International Association on Occupational Health, papers and discussions on factors influencing agricultural exposure to pesticides were presented. General papers summarized the importance of assessment of pesticide exposure and medical testing. Three technical papers discussed the importance of proper pesticide formulation, application and personal protection. A total of 13 papers on field studies were presented covering cases of exposure to organochlorine and organophosphorus compounds, carbamates, chlorophenoxy acetic acids, pyrethroids and methyl bromide. Miscellaneous presentations explored the effects of pesticide mixtures and technical impurities on workers and examined cholinesterase inhibition and porphyrinogenesis due to agricultural pesticides. Recommendations were made for the gathering of information on worker exposure through field studies and measurement of plasma cholinesterase levels.

80-2833. Trussell, R. R.; Trussell, A. R. (Consult. Eng. Inc., Pasadena, CA) **Evaluation and treatment of synthetic organics in drinking water supplies.** *J. Am. Water Works Assoc.* 72(8): 458-470; 1980 (51 references).

Several practical techniques which may be used by a water utility to deal with organic contamination are discussed. Dealing with synthetic organics is broken into 6 steps: source evaluation, risk assessment, feasibility analysis, scheduled periodic surveillance, cost-benefit analysis and implementation. Source evaluation includes the gathering of water samples and analyzing them to isolate the organics from the water, resolving the mixture of organics in the isolate, and detection and identification of the specific contaminant. A list of chemical indicators of industrial contamination is presented in tabular form, and includes several organochlorine pesticides and PCB's. If the evaluation of the water source and the risk assessment demonstrate that the water supply is safe, only routine monitoring of the water is required. If these steps indicate that the water quality is not acceptable, then a feasibility study must be conducted to determine the most cost effective means of improving it. Bench, pilot and field studies may all be required. After a cost benefit analysis is conducted, implementation of the chosen plan is begun.

80-2834. Hogstedt, C. (Author address not given) **Kohortstudie av dodsorsaker for skogsarbetare med och utan exposition for fenoxisyrapreparat. [Cohort study of the causes of death among forestry workers with and without exposure to phenoxy acid preparations.]** *Lakartidningen* 77(19): 1828-1831; 1980 (15 references) (Swedish).

The causes of death were analyzed on the basis of payroll data for 142 forestry workers exposed to phenoxy acid preparations and for 244 unexposed workers during

the 1950s and 1960s. Expected and observed deaths were considered only if they occurred before the age of 80 yr. Analysis without allowance for a 10 yr latency period was carried out for exposed workers totalling 2751.5 person-yr and unexposed workers totalling 298 person-yr. The overall death rate was 29 (28 expected) among exposed workers and 47 (64.4 expected) among unexposed workers. Tumor was the cause of death in 5 exposed workers (6.4 expected) and 10 among unexposed workers (14.7 expected). Tumor incidence was significantly increased among crewleaders most intensely exposed (3 *vs.* 1 expected, as compared with 2 cases among other exposed workers *vs.* 5.4 expected). Diseases of the circulatory organs were the cause of death in 16 exposed and 24 unexposed workers compared with respective expected values of 12.9 and 29.6. With allowance for a 10 yr latency period the overall death rate was 21 among the exposed workers (18.2 expected) and 38 among the unexposed ones (41.9 expected). Tumors were the cause of death in 3 exposed workers (4.2 expected) and in 7 unexposed workers (9.7 expected). Tumor mortality was significantly increased among intensely exposed crewleaders (2 cases *vs.* 0.7 expected, compared to 1 case *vs.* 3.5 expected among the other exposed workers). Diseases of circulatory organs were the cause of death in 10 exposed and 22 unexposed workers compared with the respective expected values of 9.1 and 20.8.

80-2835. Blejer, H. P. (Dir. Occup. Health, City of Hope, CA) **Is your patient's job killing him?** *Medical Times* 108(7): 91-95; 1980 (9 references).

The major difference between industrial pollution and that which affects the general population lies in the degree or severity of long term, chronic exposure to hazardous chemical agents. Adverse effects caused by exposure to specific chemicals are detected more readily and earlier in groups of occupationally exposed persons. Epidemiological studies conducted on exposed workers can be used to detect the distribution of various causes of death among the exposed population. DDT has been linked with brain and nerve damage and has caused behavioral dysfunction. DBCP has been noted to cause damage to sperm and thereby decrease fertility. The liver is the apparent target tissue for carcinogens such as aldrin, DDT, dieldrin, heptachlor, and PCB's.

80-2836. Schear, M. (Author address not given) **Taetigkeitsbericht der Eidg. Kommission fuer Volksernaehrung, Lebensmittel gesetzgebung und -kontrolle (EEK) zuhanden des Eidg. Departementes des Innern fuer das Jahr 1979. [Activity report of the Commission on Nutrition, Food Legislation and Food Control (EEK) of the Department of the Interior of the Swiss Confederation for the year 1979.]** *Mitt. Geb. Lebensmittelunters. Hyg.* 71(2): 155-162; 1980 (Multilingual).

Recommendations submitted by subcommittees of the Advisory Commission on Legislation for the Control of Harmful Substances in Foods of the Swiss Ministry of the Interior to the commission's 1979 plenary session dealing with toxic residues in foods, sweeteners, and the total revision of existing legislation pertaining to food are presented. Nitrates in drinking water and foods were found to have no harmful effects. The harmful effects of pesticides in tobacco were concluded to be insignificant when compared to those of smoking. A total revision of existing food legislation and mandatory display of all additives on food labels are recommended. [Article is in German and French]

80-2837. Ando, M.; Adachi, S.; Taya, T.; Tamura, K. (Environ. Health Sci. Div., Natl. Inst. Environ. Stud., Ibaraki, Japan) **[Aerial concentration change of pesticide sprayed in the orchard and exposure of the sprayman to it.]** *Nippon Noson Igakkai Zasshi (Jpn. J. Rural Med.)* 29(1): 36-43; 1980 (11 references) (Japanese).

Respiratory and dermal exposure of the driver of an automatic pesticide spraying machine used to apply a diluted pesticide mixture (fenitrothion and a fungicide) were studied in pear orchards. The aerial concentration of the pesticide was also measured in the orchard and nearby houses. The amount of pesticide deposited on the clothing showed no difference for operators running the large machines or the smaller machines. Clothing pesticide levels were larger in spring (1.6-3.5 mg/100 cm^2 clothing/hr) than in summer (0.19-0.43 mg/100 cm^2/hr). Application of a hood to the sprayer reduced the amount of pesticide deposition. However, the aerial concentration at the height of respiration of the operator was higher (9.054 mg/m^3) in the sprayer with the hood than in the sprayer without the hood (0.033 mg/m^3). This effect was presumed to be due to the air flow by the cooler of the sprayer and to the difference of particle size between those deposited on the clothing and those suspended in the air. Serum cholinesterase activity of the sprayer and the workmen in the orchard did not show large differences when measured before and after the spraying. The number of minute particles < 2.1 μm in average diameter which cause problems during respiratory exposure comprised 42.5% of the total aerial concentration after 30 min of pesticide application. More than 90 min were required for substantial disappearance of the pesticide particles from the air of the orchard. A considerable amount of pesticide particles < 1 μm in average diameter was found in houses in the neighborhood of the orchard during the spraying of the pesticide by a speed sprayer.

80-2838. Masumitsu, T.; Nagata, J.; Kobayashi, H.; Ono, S. (Hokushin Gen. Hosp., Nakano, Nagano, Japan) **[Studies on intoxication due to a natural insecticide, nicotine (Report 1).]** *Nippon Noson Igakkai Zasshi (Jpn. J. Rural Med.)* 29(1): 61; 1980 (Japanese).

During a 6-yr period at a Japanese hospital, the share of pesticide intoxications due to nicotine was 5.7% . Of the 204 cases of pesticide poisonings over a 12 yr period that were due to insecticidal spraying of apple orchards, a total of 66 cases were due to nicotine (35 cases in men and 26 cases in women). Of these cases due to nicotine, 75.4% occurred when the insecticide was applied with another pesticide such as Bordeaux mixture. In cases where nicotine was used in combination with another pesticide, symptoms of vomiting, nausea, dyspnea and loss of consciousness indicated that the major cause of intoxication was due to the presence of nicotine. When nicotine poisoning was diagnosed, the time from application of the pesticide to the onset of symptoms was usually between 1 and 12 hr, with 33% of the cases showing symptoms within 1 hr of nicotine application. Patients admitted for treatment of nicotine intoxication generally stayed in the hospital for 2 to 3 days. Sixty-one patients exposed to nicotine were polled for smoking habits to study the effects of tobacco smoke on the onset of symptoms of nicotine poisoning due to exposure to the insecticide. Only 9 of the 61 patients questioned were smokers, suggesting that onset of symptoms of nicotine poisoning was due mainly to dermal exposure to the pesticide. Almost all of the patients had reported that they had applied the insecticide by hand on a hot day for extended periods of time without the use of protective devices.

80-2839. Komiyama, T.; Tuchiya, T.; Hara, M.; Satoyama, Y.; Chiba, Y.; Hara, S. (Dep. Neurol., Fac. Med., Shinshu Univ., Matsumoto, Nagano, Japan) **[On the four fatal cases due to paraquat-dichloride intoxication.]** *Nippon Noson Igakkai Zasshi (Jpn. J. Rural Med.)* 29(1): 61-62; 1980 (1 reference) (Japanese).

Four fatal cases of intoxication due to paraquat-dichloride in 1979 are discussed. The ingested amount was smaller than 20 ml (24% formulation) except for one case of 90 to 100 ml. Following ingestion, stomach-wash and artificial vomiting were performed. Within 24 hr of the ingestion, pharyngeal pain and erosion of the mucous membranes of the oral cavity were found. Within 48 hr of ingestion, jaundice and reduction of urine began and culminated with anuria and loss of consciousness. Although all cases had been treated by blood dialysis combined with an artificial hepatic support, delays in treatment and in one case the ingestion of a very large amount resulted in failure to save the patients.

80-2840. Webb, K. S.; Gough, T. A. (Lab. Gov. Chem., London SE1, England) **Human exposure to preformed environmental *N*-nitroso compounds in the UK.** *Oncology* 37(4): 195-198; 1980 (10 references).

For 12 yr the Laboratory of the Government Chemist of England has been monitoring the levels of *N*-nitrosamines in drinking water, foodstuffs, and other substances. Cutting fluids were found to contain small residues of *N*-nitrosodiethanolamine (NDMA). NDMA has been found at the ppm level in various herbicides formulated as the amine salts. Fried bacon contained *N*-nitrosopyrrolidine in the range of 1-10 ppm with NDMA levels of up to 5 ppm. Low levels of NDMA were found in fish and cheese while levels of up to 12 ppm of NDMA were detected in beer. No *N*-nitrosamines were present in samples of normal air, however, in tobacco smoke levels of NDMA ranged up to 10 ng/cigarette. Trace levels of NDMA and *N*-nitrosomorpholine were detected in rain and river water, while no nitrosamines were found in any of the drinking water samples tested. The human intake of *N*-nitrosamines from food, beer, and cigarettes in England was somewhat lower than in other European countries.

80-2841. Bakir, F.; Tikriti, S.; Rustam, H.; Al-Damluji, S. F.; Shihristani, H. (Med. Coll. & Med. City, Baghdad, Iraq) **Clinical and epidemiological aspects of methylmercury poisoning.** *Postgrad. Med. J.* 56(651): 1-10; 1980 (49 references).

An outbreak of methylmercury poisoning occurred in Iraq in 1971-72 from the ingestion of home-made bread prepared from seed grain which had been treated with methylmercury. There was a distinct correlation between the amount of mercury in the blood and the amount of bread eaten. Infants and children had higher blood mercury levels. Most of the symptoms were confined to the central nervous system and developed 1 to 2 mo after poisoning. Mental retardation with delayed onset of speech and impaired motor, sensory and autonomic function, blindness and deafness were reported in the children. Adults experienced sensory symptoms sometimes accompanied by cerebellar signs and in severe cases gross ataxia with marked visual and hearing loss progressing to a kinetic mutism followed by coma. Peripheral nerves were not involved. Treatment consisted of the use of chelating agents, thiol resin, hemodialysis and exchange transfusion. However, no real benefit from treatment was obtained. Eight infants known to have been exposed through breast milk had mercury levels in the blood of 200 ng/ml, but have not exhibited any signs of toxicity.

80-2842. Castot, A.; Garnier, R.; Lanfranchi, C.; Bavoux, F. (Cent. Pharmacovigilance, Hop. Fernand Widal, F-75010 Paris, France) **Effets systemiques indesirables des medicaments appliques sur la peau, chez l'enfant. A propos de quelques observations. [Systemic side effects of drugs applied cutaneously. A report of a few cases in infants.]** *Therapie* 35(3): 423-432; 1980 (53 references) (French).

Seventy-nine cases of adverse skin and systemic effects after the application of liquid antiseptic soap, antiparasitic lotions and antiinflammatory ointments to the skin of infants and children reported in 3 yr to the drug monitoring centers Fernand Widal and Saint Vincent de

Paul were reviewed. Of this total 72% were localized skin irritations, and 28% were systemic complications; 63% of the latter were observed in the under 10 yr age group. This same age group suffered only 31% of the skin irritations. In 12 cases the symptoms were digestive upsets due mostly to an antiparasitic lotion, 8 cases exhibited neurological symptoms including 4 cases of convulsions, one case exhibited an edema caused by salicylated vaseline. The offending active substances included organochlorine insecticides or organic solvents (digestive upsets including nausea, vomiting, diarrhea, abdominal pain), dexamethasone, and salicylamide. Two cases involving convulsions were due to antiseptic soap containing trichlorocarbanilide. Other cases with adverse effects due to transfollicular and transepidermic penetration of boric acid, vitamin A, iodine, dimazol, benzyl benzoate and camphor are reviewed.

80-2843. Mackenthun, K. M.; Brossman, M. W.; Kohler, J. A.; Terrell, C. R. (Criteria & Stand. Div., Off. Water & Waste Manage., US EPA, Washington, DC 20460) **Approaches for mitigating the Kepone contamination in the Hopewell/James River area of Virginia.** *US EPA Rep.* EPA 600/3-79-102: pp. 241-260; 1979 (5 references).

This paper summarizes the nature of the contamination found in the Hopewell/James River area and describes the mitigation approaches evaluated and the mitigation actions recommended. Extensive sampling efforts revealed highly persistent Kepone (chlordecone) contamination remains in Hopewell soil, in sewage lines and streams and in the James River. The investigation of conventional mitigation-removal approaches included an analysis of world-wide dredging techniques. A wide range of non-conventional mitigation approaches was evaluated for dredge spoil fixation, elutriate treatment, *in situ* stabilization, and isolation. Approaches ranged from silicate, organic- and sulfur-based fixation agents through use of retrievable sorbents which would take up Kepone from the contaminated sediments and water. Natural degradation and biological mitigation approaches were examined concurrently with engineering approaches. However, none of these approaches shows high promise for Kepone mitigation at this time. As a result of these investigations, a number of immediate mitigation actions were recommended in addition to further development of promising mitigation techniques. Among the recommendations was the adaptation of Japanese dredging and sediment fixation technology. In addition, the investigative techniques and findings were recommended for solution of other similar waterway contamination problems in the United States. (Author abstract by permission, abridged)

80-2844. Dennis, W. H., Jr.; Meier, E. P.; Rosencrance, A. B.; Randall, W. F.; Reagan, M. T. (Res. & Dev. Lab., Med. Bioeng., US Army, Fort Detrick, MD) **Chemical degradation of military standard formulations of organophosphorus and carbamate pesticides. II. Degradation of diazinon by sodium hypochlorite.** *US NTIS AD Rep. AD-A081,098:* 44 pp.; 1979 (34 references).

Diazinon is rapidly degraded by sodium hypochlorite between pH 8 and 10, yielding two principal end products, acetic acid and isobutyramidinium trichloroacetate. Treatment with hypochlorite reduces the acute toxicity of diazinon dust formulations to bluegill sunfish at least 3700-fold. Bioassay data indicate that a diazinon emulsifiable concentrate formulation retains considerable toxicity after treatment with sodium hypochlorite. The toxic components of the emulsifiable concentrate mixture were identified as heavy aromatic naphtha from the formulation and the chlorinated aromatic hydrocarbons produced by hypochlorite reaction with the naphtha. The components are almost as toxic as the diazinon formulations. A model approach emphasizing the need for bioassay data in development of chemical disposal systems is proposed and discussed. (Author abstract by permission)

80-2845. US EPA, Washington, DC **Ambient water quality criteria: chlordane.** *US NTIS PB Rep.* PB-292,425: 70 pp.; 1978 (54 references).

Section 304(a) of the Clean Water Act [33 U.S.C. 1314(a)], requires EPA to publish and periodically update water quality criteria. These criteria are to reflect the latest scientific knowledge on the identifiable effects of pollutants on public health and welfare, aquatic life, and recreation. This report presents water quality criteria for the insecticide, chlordane. It presents concentration criteria for the protection of fresh water and saltwater aquatic life. It presents safe concentrations for humans, and in the case of suspect or proven carcinogens, gives various levels of incremental cancer risk. A section 304(a) water quality criterion is a qualitative or quantitative estimate of the concentration of a water constituent or pollutant in ambient waters which, when not exceeded, will ensure a water quality sufficient to protect a specified water use. Under the Act a criterion is a scientific entity, based solely on data and scientific judgment. It does not reflect considerations of economic or technological feasibility nor is it a water quality standard and in itself has no regulatory effect. (Author abstract by permission)

80-2846. US EPA, Washington, DC **Ambient water quality criteria: 2,4-dichlorophenol.** *US NTIS PB Rep.* PB-292,431: 78 pp.; 1978 (66 references).

Section 304(a) of the Clean Water Act [33 U.S.C. 1314(a], requires EPA to publish and periodically update water quality criteria. These criteria are to reflect the latest scientific knowledge on the identifiable effects of

pollutants on public health and welfare, aquatic life, and recreation. This report presents water quality criteria for 2,4-dichlorophenol. It presents concentration criteria for the protection of fresh water and saltwater aquatic life. It presents safe concentrations for humans, and in the case of suspect or proven carcinogens, gives various levels of incremental cancer risk. A section 304(a) water quality criterion is a qualitative or quantitative estimate of the concentration of a water constituents or pollutant in ambient waters which, when not exceeded, will ensure a water quality sufficient to protect a specific water use. Under the Act a criterion is a scientific entity, based solely on data and scientific judgement. It does not reflect considerations of economic or technological feasibility nor is it a water quality standard and in itself has no regulatory effect. (Author abstract by permission)

80-2847. US GAO, Washington, DC **U. S. ground troops in South Vietnam were in areas sprayed with Herbicide Orange.** *US NTIS PB Rep. PB-113,194:* 23 pp.; 1979.

Between 1966 and 1969 a large number of US ground troops in Vietnam were in areas sprayed with Herbicide Orange (2,4,5-T and 2,4-D) both during and shortly after spraying. DOD took few precautions to prevent exposure because at that time it did not consider the herbicide to be toxic or dangerous to humans. Marines assigned to units in sprayed areas can be identified, but Army personnel cannot because Army records are incomplete. Troops' actual exposure or the degree of exposure to the herbicide cannot be documented from available records. Also, the long-term effects of exposure remain largely unknown. The Congress should direct DOD, VA, HEW, or the Environmental Protection Agency to determine whether a study is needed of the health effects of Herbicide Orange on ground troops discussed in this report. GAO issued this report at the request of Senator Charles Percy, Ranking Minority Member of the Permanent Subcomittee on Investigations, Senate Committee on Governmental Affairs. (Author abstract by permission)

80-2848. Anonymous **Report of the International Workshop.** In: *The Use of Biological Specimens for the Assessment of Human Exposure to Environmental Pollutants.* Berlin, A., Wolff, A. H. and Hasegawa, Y. eds. (Martinus Nijhoff:The Hague): pp. 1-51; 1979.

A report is given of an international workshop, *The Use of Biological Specimens for the Assessment of Human Exposure to Environmental Pollutants* held in Luxembourg from April 18-22, 1977. The workshop was sponsored by the Commission of the European Communities, the US EPA, and the World Health Organization. Operations and conceptual aspects of collection, preparation, analysis and storage of biological specimens were examined in an effort to study the potential risks of pollution to humans. The selection of pollutants and biological specimens, technical considerations, including analysis, standards and quality control, and design and organization of programs were major topics of the workshop. A table was drawn up listing the biological tissues amenable at present to the biological monitoring of such environmental pollutants as Ar, Cd, Cr, Pb, inorganic mercury, methyl mercury, CO, organochlorine pesticides, PCP, PCB, chlorinated solvents, and benzene. Indicator specimens requiring further research for the biological monitoring of Ni, asbestos, the phenoxy herbicides, TCDD, benzofuran, azobenzene, chlorinated solvents, plastic monomers, polycyclic hydrocarbons, amino-, nitroso-, and nitroderivatives, organophosphorus esters, mycotoxins and antibiotics were also enumerated. The recommendations and conclusions of the workshop are given. Twenty-eight working papers were presented, each followed by references. Addresses of workshop participants are also provided.

80-2849. Bardodej, Z. (Dep. Med. Chem., Med. Fac. Hyg., Prague, Czechoslovakia) **Pesticides and other persistent chemicals: collection and storage of biological specimens from human populations.** In: *The Use of Biological Specimens for the Assessment of Human Exposure to Environmental Pollutants.* Berlin, A., Wolff, A. H. and Hasegawa, Y., eds. (Martinus Nijhoff:The Hague): pp. 55-63; 1979 (28 references).

The dangers of organochlorine pesticide, PCB, and mercury have been uncovered in animal studies and medical examinations of humans occupationally exposed to these substances. They are well known environmental pollutants, and their residues have been measured in food and human adipose tissue. Further studies are needed on different population groups to better understand the toxicity of organochlorine pesticides, PCB, and mercury. The limited knowledge of effects due to chronic exposure to these substances has precluded definite statements on their possible carcinogenicity and mutagenicity. Standardization in sampling, storage, and analysis methods for human epidemiological studies is strongly recommended when investigating the effects of environmental pollutants. Residue data should be maintained on a variety of specimens such as nails, hair, and urine from living subjects and liver, brain and kidney from post-mortem specimens. A storage temperature of -40°C is recommended for samples set aside for future reference. Specimen mailing costs of no more than $10.00 for a domestic shipment and $30.00 for an international shipment are suggested. Studies on humans to monitor environmental pollution in Czechoslovakia are recommended, provided medical ethics, mail, antiepidemic, and customs regulations are respected.

80-2850. Paccagnella, B.; Favaretti, C. (Inst. Hyg., Univ. Padova, Verona, Italy) **Biological specimen collec-**

tion from human populations for biological monitoring and future reference: organic halogenated compounds. In: *The Use of Biological Specimens for the Assessment of Human Exposure to Environmental Pollutants.* Berlin, A., Wolff, A. H. and Hasegawa, Y., eds. (Martinus Nijhoff: The Hague): pp. 303-306; 1979 (39 references).

In Italy, the majority of biological monitoring of human populations has been focused on the organic halogenated compounds, especially the chlorinated pesticides. Epidemiological investigations on two populations A and B were conducted in Italy. Area A showed a greater use of organochlorine pesticides than B. Determinations of pesticide residues in human and animal adipose tissue and in fruits, vegetables, hay, soil, well, drinking, and river water, and raw and pasteurized milk were conducted on samples from each of the two areas. No differences were found in the pesticide residues in fat samples from A and B, but the level of organochlorine pesticide residues was slightly higher in samples from area A. Consistently higher morbidity was also associated with the population from area A. Another study of a human population from Ferrara Province having no occupational exposure to pesticides showed residues of *p,p'*-DDE in the fat, liver, spleen, kidneys and brain, *p,p'*-TDE in spleen, and *o,p'*-DDT in kidney. In the same study *p,p'*-DDT was found in fat, liver and kidney. Other investigations on the monitoring of organochlorine pesticides in Italy are briefly mentioned. Studies on polyvinyl chloride are included. 2,4,5-T and 2,4,5-TP (silvex) were banned from use in Italy in 1970. The metabolic pathways of some of the pesticides and their toxic effects are listed. Organs, tissues and biological fluids useful in the monitoring of environmental pollution are examined in relation to their collection and storage. Legal, economic, and organizational aspects of biological monitoring programs in Italy are also presented.

80-2851. Daburov, K. N.; Pivovarov, Yu. P.; Sazonova, L. P. (Dep. Gen. Hyg., N. I. Pirogov Med. Inst. II, Moscow, USSR) **Sanitarno-mikrobiologicheskoe normirovanie *Bacillus thuringensis* – produtsentov bakterial'nykh insektitsidov v rastitel'nykh produktakh. [Sanitary and microbiological standardization of *Bacillus thuringiensis*, producers of bacterial insecticides in plant products.]** *Vopr. Pitan.* (3): 63-67; 1980 (22 references) (Russian).

To determine the permissible residual amounts of bacterial insecticides (products of *Bacillus thuringenesis)* in plant products, the effects of various methods of food processing on spore survival were studied. Existing methods of food processing do not provide complete spore control. Survival rates and residual amounts of spores depend upon the initial application rate. It was recommended that application rates should not exceed 10^3 spores/g vegetable and 10^5 spores/g fruit.

See also 80-2708, 80-2724, 80-2770, 80-2779, 80-2784, 80-2794, 80-2811, 80-2812, 80-2965, *and* 80-2997.

80-2852. Paulov, S. (Fac. Natur. Sci., Comenski Univ., Bratislava, Czechoslovakia) **Ucinnost herbicidu dinoseb-acetatu na aktivitu transaminaz GOT a GPT vo svaloch ryb. [Effect of dinoseb acetate on the GOT and GPT activities in fish muscles.]** *Agrochemia* 20(5): 147-149; 1980 (7 references) (Slovak).

The effect of the herbicide Aretit, containing 40% dinoseb acetate as active agent, on GOT and GPT activity in muscles of *Carassius carassius* L was studied on fish which spent 4 days in water contaminated with the herbicide. Enzyme activities were determined in the homogenate of musculus lateralis superficialis, and the values obtained were compared with the values from control specimens. In both the experimental and control groups GOT values were found to be higher than the GPT values. Dinoseb acetate in the muscle reduced GOT activity, while GPT activity remained unaffected (this applies for both 0.1 mg/l and 0.2 mg/l concentrations of dinoseb and also for fish after only a single day in contaminated water). In contrast, in *in vitro* experiments GOT activity was stimulated by dinoseb, which also happened in the serum of the contaminated fish. Thus the effect of dinoseb on enzymatic activity varies not only between organisms but also between organs.

80-2853. Oshima, H.; Nishimura, H.; Nishimura, N. (Dep. Hyg., Aichi Med. Univ., Nagoya, Aichi, Japan) **[Experimental studies on the toxicity of a herbicide, paraquat dichloride (Report I).]** *Aichi Ika Daigaku Igakkai Zasshi (J. Aichi Med. Univ. Assoc.)* 7(2): 98-103; 1979 (15 references) (Japanese).

The subacute toxicity of paraquat dichloride was examined by orally administering 0, 5, 10, and 20 mg of the compound to 4 groups of male Wistar rats twice a wk for 1 mo. Paraquat dichloride administration had no effect on body weight of the rats. No effect of paraquat dichloride on organ weight was observed, except for a slight reduction in liver weight in the treated animals. The rate of mitosis of hepatic cells was increased in the livers of treated rats. In hematological examinations, the hematocrit level of treated animals was not significantly different from that of controls. Serum GOT, GPT, and LDH levels of the treated groups were significantly lower than those of controls. The major effect of paraquat dichloride was found in the lung with thickening of the alveolar septae. Many macrophages were present and inflammatory cell infiltration consisted of eosinophils and small round cells.

80-2854. Palmer, J. S.; Rowe, L. D.; Crookshank, H. R. (Vet. Toxicol. & Entomol. Res. Lab., Agric. Res., SEA, USDA, College Station TX 77840) **Effect of age on tolerance of calves to chlorpyrifos.** *Am. J. Vet. Res.* 41(8): 1323-1325; 1980 (15 references).

Topical applications of chlorpyrifos were administered to 2 groups of calves. Calves in the first group were 1-2 wk old, in the second they were 4-6 mo old. Newborn calves also received oral doses of chlorpyrifos. Topical applications amounted to 0.02%, 0.06% or 0.12% sprayed over the entire body surface. Oral dosages were 5, 10 or 25 mg/kg. Older calves received topical applications at 0.25%, 0.5%, 0.9% or 2.3%. Signs of toxicosis were present in newborn calves given chlorpyrifos orally and topically at doses of 25 mg/kg and 0.06%, respectively. Newborn calves sprayed with 0.12% chlorpyrifos were severely poisoned. Older calves sprayed with 0.25%, 0.5% or 0.9% did not display signs of poisoning. It appeared that 4-6 mo old calves had an increased tolerance to topical applications of chlorpyrifos.

80-2855. Giurgea, R.; Koszta, M. (Biol. Forschungszentr., Cluj, Romania) **Die Wirkung des Herbizid "Atrazin" auf Thymus und Bursa bei Kueken. [Effect of the herbicide atrazine on the thymus and bursa of chickens.]** *Exp. Veterinaermed.* 33(5): 703-707; 1979 (8 references) (German).

Atrazine was incorporated at 150 ppm into the diet of 3-day-old Studler-Cornish chicks. The chicks were killed by decapitation at 3, 6, 10, 15 or 21 days after the beginning of feeding, and blood, bursa of Fabricius, thymus and adrenals collected from each. Thymus and bursa weight increases exceeded those of controls at 15 and 21 days. The glycogen content in the bursa and thymus of atrazine-treated birds increased, while the total protein content of the blood serum decreased. The increase in glycogen content was interpreted as representing glyconeogenesis with participation of glucoplastic amino acids. The decrease in the serum protein content was linked with pyelonephritis, which atrazine had previously been reported to produce. The results did not confirm the hypothesis that glycogen accumulation implies an involutional state of the lymph organs. The ascorbic acid content in the adrenals increased, indicating that they were not in a state of stress. The changes observed in the central lymph organs resemble those produced by some organochlorine compounds; this may be due to the chlorine atom in the herbicide molecule. The process of neuroendocrine maturation also influenced the findings.

80-2856. Rocchi, P.; Perocco, P.; Alberghini, W.; Fini, A.; Prodi, G. (Ist. Cancerol. & Patol. Gen., Univ. Bologna, I-40100 Bologna, Italy) **Effect of pesticides on scheduled and unscheduled DNA synthesis of rat thymocytes and human lymphocytes.** *Arch. Toxicol.* 45(2): 101-108; 1980 (15 references).

The action of seventeen pesticides (insecticides, fungicides and herbicides) has been studied with short-term *in vitro* system using rat thymocytes and/or human lymphocytes. The parameters studied were: a) the action of chemicals tested in scalar doses on DNA synthesis of rat thymocytes; b) damage exerted by pesticides on human

lymphocyte DNA measured as unscheduled DNA synthesis; c) the interference of chemicals tested with human lymphocyte repair capability after damage exerted on cells by ultraviolet rays. The results obtained suggest that some of the tested pesticides don't induce damages to human lymphocyte DNA, some others elicit low DNA repair if compared to the repair following a standard ultraviolet irradiation and some of them (6/17) exert a marked inhibition of cell repair processes after ultraviolet irradiation. Data are discussed on the basis of a possible role played by these substances as carcinogenic agents in the environment. (Author abstract by permission)

80-2857. Spindeldreier, A.; Deichmann, B. (Stockflethweg 21, D-2000 Hamburg 62, BRD) **Kontaktdermatitis auf ein Holzschutzmittel mit neuer fungizider Wirksubstanz. [Contact dermatitis against a wood preservative with a new fungicidal agent.]** *Berufs-Dermatosen* 28(3): 88-90; 1980 (2 references) (German).

Three cases of allergic reactions following contact with and/or exposure to the new fungicidal wood preservative tetrachlorophthalonitril which was certified in 1977 are reported. The symptoms included itching erythema followed by periorbital facial swelling, reddening and swelling of face, and blister formation which spread to forearm areas. Actual contact with the preservative was not verified in all cases. Epicutaneous tests carried out with the chemical in 1:100 dilution in vaseline resulted in severe eczematous reactions within 24 hr following application. These reactions did not cease until the dilution reached the 1:10,000 ratio.

80-2858. Gabelova, A.; Slamenova, D. (Cancer Res. Inst., Slovak Acad. Sci., Bratislava, Czechoslovakia) **The effect of trimorphamide and sodium azide on mammalian cells cultivated *in vitro*.** *Biologia (Bratislava)* 35(6): 399-404; 1980 (14 references).

Mutagenic properties of trimorphamide and sodium azide were studied on hamster fibroblasts cultivated *in vitro*. The plating efficiency test demonstrated that trimorphamide had only a slight cytostatic effect compared with sodium azide and UV-radiation. Sodium azide demonstrated a strong cytostatic effect, and there was a suggestion that it may cause damage to the DNA molecule. The DNA-synthesis inhibition test demonstrated that UV-radiation had an inhibitory effect on DNA synthesis, but that neither trimorphamide nor sodium azide inhibited daughter DNA synthesis and therefore were not damaging the DNA molecule. It was concluded that these two chemicals are probably not mutagenic nor carcinogenic.

80-2859. Niimi, A. J.; Cho, C. Y. (Canada Cent. Inland Waters, Burlington, Ontario L7S 1X9, Canada) **Uptake of hexachlorobenzene (HCB) from feed by rainbow trout *(Salmo gairdneri)*.** *Bull. Environ. Contam. Toxicol.* 24(6): 834-839; 1980 (24 references).

A study was conducted to examine the uptake of hexachlorobenzene (HCB) from food. Groups of 8 trout were placed in well aerated, lighted 47 ℓ aquaria with an inflow of 35 ℓ/hr. They were given food containing 4 (control), 6, 8, 394 and 780 μg/kg HCB twice a day. Fish were sampled 20, 35, 47 and 57 days after feeding HCB commenced. Each fish was ground and homogenized. A 10 g sample was analyzed for lipid content and HCB levels. Results showed an increase in HCB from 0.02 to 0.09 μg/kg/day for groups fed the 3 lowest concentrations for 57 days. Groups fed 394 and 780 g/kg showed the greatest increase in HCB. The rate of accumulation was highest for the first 20 days (9 and 15 μg/kg, respectively), then gradually decreased. Trout retained 80-90% of the HCB ingested. Bioaccumulation of the HCB is consistent with observations on other persistent chemicals, such as PCB, DDT and dieldrin.

80-2860. Kumaraguru, A. K.; Selvi, D.; Venugopalan, V. K. (Dep. Zool., Univ. Guelph, Guelph, Ontario N1G 2W1, Canada) **Copper toxicity to an estuarine clam *(Meretrix casta)*.** *Bull. Environ. Contam. Toxicol.* 24(6): 853-857; 1980 (12 references).

The use of pesticides and fungicides containing heavy metals is suggested to be a significant source of heavy metals in the aquatic environment. Toxic effects of the heavy metal copper on *Meretrix casta* were studied. The 96 hr LC50 value was found to be 0.57 ppm for *M. casta*. Median lethal times (LT50s) for copper exposure were 158, 112, 97, 88 and 80 hr for 0.20, 0.30, 0.40, 0.60 and 1.50 ppm, respectively. The toxic action was suggested to be due to asphyxiation caused by coagulation of mucus over gills. All treated animals were sluggish, showed mucus coagulation on the gills, and mantle and gills turned yellowish in color. An abnormal liquid pouch was noted in one of the animals exposed to 0.5 ppm copper for 1 wk, and is suggested to indicate toxic action of the metal on the tegument. Copper concentrations in soft tissues were 1005 ± 58 ppm *vs.* 11.3 ± 0.6 ppm in controls.

80-2861. Bhagyalakshmi, A.; Ramamurthi, R. (Dep. Zool., Sri Venkateswara Univ. Coll., Tirupati: 517502, India) **Recovery of acetylcholinesterase activity from fenitrothion-induced inhibition in the freshwater field crab *(Oziotelphusa senex senex)*.** *Bull. Environ. Contam. Toxicol.* 24(6): 866-869; 1980 (17 references).

Studies were performed to determine the changes in the acetylcholinesterase (AChE) activity in crabs following the injection of sublethal doses of fenitrothion. Three sublethal doses of 5, 7.5 and 10 μg of pesticide were injected into intermolt crabs of either sex. At 1, 6, 12, 24 and 72 hr after injection, the thoracic ganglionic mass was

dissected out and the AChE activity was determined. After 1 hr, AChE activity was inhibited by all 3 dose levels. Maximal inhibition occurred after 12 hr for all 3 doses. The 24 hr and 72 hr activity demonstrated recovery from the inhibition. It appears that the pesticide is being either metabolized or removed from the site of action, thus enabling the enzyme to resume activity.

80-2862. Sahib, I. K. A.; Rao, K. V. R. (Dep. Zool., SV Univ., Tirupati 517502 AP, India) **Toxicity of malathion to the freshwater fish *Tilapia mossombica*.** *Bull. Environ. Contam. Toxicol.* 24(6): 870-874; 1980 (14 references).

The effects of malathion on the freshwater teleost fish *Tilapia mossombica* was tested in static bioassays. LC50 values were determined in two ways: six concentrations of the pesticide (1, 2, 4, 6, 8 and 10 ppm) and five concentrations in log-2 proportions (1-16 ppm) were used. Ten fish were exposed to each concentration. The first method provided an LC50 estimate of 5.5 mg/l, while the second method resulted in an estimate of 5.6 mg/l. When compared to LC50 values for other fish, this study showed that malathion was more toxic to *Tilapia* than to fathead minnows, but less toxic than to guppies and bluegills.

80-2863. Mohanachari, V.; Neereja, P.; Indira, K.; Swami, K. S. (Dep. Zool., Sri Venkateswara Univ., Tirupati 517502, India) **Inhibition of sheep liver arginase by malathion.** *Bull. Environ. Contam. Toxicol.* 24(6): 875-878; 1980 (14 references).

A study is presented which was designed to elucidate a possible damaging effect of malathion on sheep hepatic arginase activity. Enzyme activity of malathion-treated and control liver homogenates was determined. A decrease in activity of 19% was seen in treated homogenates. The Michaelis-Menten constant showed an increase of 40% over control. The results presented indicate that 100 μg of malathion was sufficient to alter the kinetics of the liver enzyme arginase.

80-2864. Wolfe, J. L.; Esher, R. J. (Dep. Biol. Sci., Mississippi State Univ., Mississippi State, MS 39762) **Toxicity of carbofuran and lindane to the old-field mouse (*Peromyscus polionotus*) and the cotton mouse (*P. gossypinus*).** *Bull. Environ. Contam. Toxicol.* 24(6): 894-902; 1980 (18 references).

Studies were performed to determine the toxicity of carbofuran and lindane to mice. Old-field and cotton mice were trapped from wild populations. Trapped animals as well as first-generation laboratory offspring were used. Eight-month chronic effects and behavioral tests were performed. In chronic tests 0.2 mg lindane/g of food and 0.1 mg carbofuran/g of food were fed to the mice. Male survivors of the chronic tests were used in behavioral studies. Behavioral studies were also conducted on untreated mice for 3 days, as a pre-treatment control, before experimental testing for the next 14 days during which they were fed the pesticide diet. Chronic exposure resulted in no difference in food consumption or mortality between the experimental group and controls. There were no significant adverse effects on reproduction, growth and development of young or behavior of adults.

80-2865. Wilson, B. W.; Cisson, C. M.; Randall, W. R.; Woodrow, J. E.; Seiber, J. N.; Knaak, J. B. (Dep. Avian Sci., Univ. California, Davis CA 95616) **Organophosphate risk assessment: field testing of DEF with the scaleless chicken.** *Bull. Environ. Contam. Toxicol.* 24(6): 921-928; 1980 (12 references).

Scaleless chickens, which are virtually devoid of feathers, were used in field studies designed to assess the possible delayed neurotoxicity of the herbicide *S,S,S*-tributylphosphorotrithioate (DEF). Two mature cotton fields of approximately 40 acres (99 ha) each were treated within DEF-6 (6 lb/gal; 2.7 kg/4.23 *l*) at 0.37 gal/acre (3.46 l/ha) using a ground vehicle. Groups of 3 hens each were placed at various points: 400 m away from the site, in a dirt road between the 2 fields, within the rows of cotton and sprayed directly by the rig (row), in unsprayed cotton 8 rows away from the path of the applicator, and in a cage on the spray rig. Mylar sheets or Petri dishes were placed at each site to sample the amount of DEF exposure. Blood samples were collected 2, 8, 15, 22 and 29 days after the first exposure, and plasma CHE activity determined by a radiometric assay. DEF was analyzed by gas chromatography. DEF exposure ranged from negligible to 108 $\mu g/cm^2$ in repeated exposure row groups. With the exception of the birds riding on the rig, CHE levels tended to decrease with increasing single exposure to DEF. A log-linear dose-response relationship for DEF and CHE was demonstrated. Plasma creatinine kinase activities rose, but increases did not correlate with the DEF exposure. No birds exhibited ataxia or other behavioral signs of delayed neurotoxicity and one died of unrelated causes. Laboratory studies showed that the scaleless chickens did develop delayed neurotoxicity following DEF injection (800 mg/kg sc). This finding and the fact that these hens are hardy in the field suggest that this may be a useful model for establishing safe field levels of organophosphates.

80-2866. Giavini, E.; Prati, M.; Vismara, C. (Lab. Embryol. & Exp. Morphol., Inst. Zool., Univ. Milano, I-20133 Milan, Italy) **Effects of triphenyltin acetate on pregnancy in the rat.** *Bull. Environ. Contam. Toxicol.* 24(6): 936-939; 1980 (7 references).

The teratogenic potential of the fungicide triphenyltin acetate (TPTA) was studied using Sprague-Dawley rats. Pregnant females were administered an

aqueous dose of TPTA by gavage at levels of 0, 5, 10 and 15 mg/kg on days 6-15 of gestation, and were sacrificed on day 15 of gestation. The total number of implantations and the number of live and dead fetuses were determined, and live fetuses examined for abnormalities. TPTA caused a dose-dependent reduction in the weight gain of treated females, while mean fetal weights did not differ significantly in control and treated groups. A statistically significant increase of postimplantation loss was found in the 15 mg/kg group. All groups treated with TPTA showed significant reduction of some ossification centers, and minor anomalies (such as asymmetrical or bipartite sternebrae and reduced ossification of pelvic girdles). Visceral examination showed no significant differences between the control and treated groups. It is concluded that TPTA does not induce teratogenic effects in the offspring of treated rats.

80-2867. Yasuno, M.; Hatakeyama, S.; Miyashita, M. (Natl. Inst. Environ. Stud., Yatabe Tsukuba 305, Japan) **Effects on reproduction in the guppy *(Poecilia reticulata)* under chronic exposure to temephos and fenitrothion.** *Bull. Environ. Contam. Toxicol.* 25(1): 29-33; 1980 (14 references).

Studies were performed on the effects of sublethal doses of two insecticides on reproduction in 3-mo-old guppies. Groups of 10 females and 3 males were exposed to 0.25, 0.5, 1.0 and 1.5 ppm temephos, and 0.1, 0.25, 1.0 and 1.5 ppm fenitrothion under semi-continuous flow conditions for 2 mo. The 1.5 ppm temephos exposure resulted in a decrease of live juveniles. Other levels caused premature parturition. Fry survivorship did not appear to be affected by the pesticide. Fenitrothion exposure resulted in a decrease of young during mo 2 of exposure to 0.25, 0.5 and 1.0 ppm. Egg production decreased during exposure but recovered after exposure ceased. The 1.0 ppm level caused all females to abort early even 2 mo after exposure ended. At 0.25 and 0.5 ppm fenitrothion caused a significantly increased level of abortions. The reaction observed is consistent with other findings and is a characteristic phenomenon found in viviparous fish.

80-2868. Christensen, E. R.; Zielski, P. A. (Cent. Great Lakes Stud., Univ. Wisconsin, Milwaukee, WS 53204) **Toxicity of arsenic and PCB to a green alga *(Chlamydomonas)*.** *Bull. Environ. Contam. Toxicol.* 25(1): 43-48; 1980 (11 references).

Studies on the toxicity of arsenic and PCB to the green alga *Chlamydomonas* are reported. Flasks of culture medium were fortified with varying concentrations of each of the test compounds. Flasks were then inoculated with 5 x 10^6 cells/l. Algal population and size distribution were measured automatically with a particle counter. PCB depressed growth at concentrations between 11 and 111 μg/L. Arsenate inhibited growth at a concentration of 1 μM. Experiments in which algal cells were exposed to combinations of these compounds indicated no interactive effects.

80-2869. Fuller, G. B.; Knauf, V.; Mueller, W.; Hobson, W. C. (Int. Cent. Environ. Saf., Albany Med. Coll., Holloman AFB, NM 88330) **PCB augments LH-induced progesterone synthesis.** *Bull. Environ. Contam. Toxicol.* 25(1): 65-68; 1980 (12 references).

In vivo studies using rats indicate progesterone synthesis is altered by PCB. After treatment with pregnant mare serum administered sc and human chorionic gonadotropin, female rats were treated with either soil (control), 20 mg PCB/kg or 20 mg HCB (hexachlorobenzene)/kg. On day 36 the rats were sacrificed and the ovaries were thin sliced and incubated. Half of the incubation vials contained ovine LH. Progesterone was determined after homogenation of the tissue samples. There was a 100% increase in progesterone synthesis in rats exposed to PCB. In controls there was a 31% increase. HCB did not significantly alter progesterone synthesis. These findings indicate that PCBs, but not HCB, alter progesterone synthesis, supporting other studies reported in the literature.

80-2870. Kuwabara, K.; Nakamura, A.; Kashimoto, T. (Lab. Food Chem., Osaka Prefect. Inst. Public Health, Higashinari-ku, Osaka 537, Japan) **Effect of petroleum oil, pesticides, PCBs and other environmental contaminants on the hatchability of *Artemia salina* dry eggs.** *Bull. Environ. Contam. Toxicol.* 25(1): 69-74; 1980 (6 references).

Studies on the effects of several environmental contaminants on brine shrimp reproduction were performed. The shrimp eggs were incubated with the test compound for 48 hr, then fixed with a picric acid solution, and the number of hatching larvae were counted microscopically. A relative hatchability for the test compound is obtained by calculating the number of hatching larvae/mg dry egg and comparing this number to that of the controls. The pesticide EPN caused a dose-related decrease in the hatch rate. A large number of organophosphorus, organochlorine, carbamate and tin pesticides had no effect on the hatchability of *Artemia salina* eggs at concentrations less than 10 ppm. The method was also tested on chicken feed additives and PCBs. The method is simple and quick for comparing toxicity of environmental chemicals.

80-2871. Bruel, M. T.; David, D. (Equipe Rech., CNRS 408, Lab. Biol. Anim., Univ. Clermont Ferrand, F-63170 Aubiere, France) **Action d'un pesticide organophosphore, le dichlorvos, sur les cellules germinales des gonades indifferenciees de jeunes embryons de Caille. [Effects of the organophosphate pesticide dichlorvos on the germ cell dif-**

ferentiation in quail embryos.] *C. R. Seances Soc. Biol. Paris* 174(2): 163-169; 1980 (11 references) (French).

Quail eggs were injected with an oil solution of dichlorvos and were incubated together with untreated control eggs for 4 days to determine the effect on the germ population at the 24 and 29 Hamburger and Hamilton chick developmental stage by counting gonocytes in two gonads. At embryonic stage 24, injected eggs exhibited 22 dead out of 40 fertilized eggs (55%). Eggs injected with oil only had 6 dead out of 15 fertilized eggs. Control eggs had 4 dead out of 48 fertilized eggs. At embryonic stage 29, treated egg mortality was 53% versus 4.1% in untreated eggs. At stage 29, the sterilizing effects of dichlorvos and gonocyte degeneration were more pronounced, indicating that the toxicity persists until an advanced developmental stage. Dichlorvos inhibited the migration of primordial germ cells and their penetration into gonads.

80-2872. Michel, R.; Tournamille, J.; Caporiccio, B.; Sentein, P. (Lab. Histol. & Embryol., Fac. Med., F-34060 Montpellier, France) **Action du propham et du chloropropham sur la mitose de lymphocytes humains en culture. Etude ultrastructurale. [Action of propham and chlorpropham on proliferating human lymphocytes. A study of the ultrastructure.]** *C. R. Seances Soc. Biol. Paris* 174(2): 176-183; 1980 (10 references) (French).

Under the electron microscope lymphocytes poisoned with propham (IPC) and chlorpropham (CIPC) exhibit anomalies of tubular structures, chromosomes and membranes. Tubular anomalies are more pronounced in the case of CIPC and exhibit complete disorganization of cellular centers or even their disintegration. Chromosomal changes are more pronounced as a result of the action of IPC and include the appearance of protuberances and decondensation of chromatin. In poisoned lymphocytes both IPC and CIPC caused the disappearance of the membrane zone of the reticulum in the metaphase. The authors hypothesize that these changes are due to progressive reduction of DNA synthesis as a function of the concentration of the weed killers with the concurrent almost total effect on protein synthesis and the obvious correlation between chromosomal anomalies and DNA and protein synthesis.

80-2873. Davis, D. G.; Shimabukuro, R. H. (Metab. & Radiat. Res. Lab., Agric. Res., SEA, USDA, Fargo, ND 58105) **Studies of herbicide toxicity and mode of action using isolated mesophyll cells and callus-derived cell suspensions.** *Can. J. Bot.* 58(13): 1482-1489; 1980 (21 references).

The possibility of using enzymatically isolated mesophyll cells of peanut and callus-derived cell suspensions of peanut and soybean to test toxicity or mode of action of diquat, paraquat and perfluidone was investigated. By this method the photosynthetic inhibition caused by 1 or 10 μM of paraquat or diquat could be rapidly analyzed. Perfluidone did not affect the cells. Diquat or paraquat (1 or 10 μM concentrations) inhibited the growth of non-photosynthetic callus-derived peanut cell suspensions either in the light or the dark. Cells treated with 0.1 μM diquat exhibited slowed growth. This was not found regarding 0.1 μM doses of paraquat. Callus-derived soybean cell suspensions grew well in 1 μM diquat or paraquat. Either herbicide at 10 μM inhibited growth. Reduced growth of the cultures from callus-derived soybean cell suspensions was not caused by destruction of organelles.

80-2874. Costella, J. C.; Virgo, B. B. (Dep. Biol., Univ. Windsor, Windsor, Ontario N9B 3P4, Canada) **Dieldrin-induced congenital inviability mediated by central nervous system hyperstimulation or by altered carbohydrate metabolism.** *Can. J. Physiol. Pharmacol.* 58(6): 633-637; 1980 (34 references).

Carbohydrate metabolism and central nervous system (CNS) intoxication were investigated as causes of dieldrin-induced congenital inviability. The 24 hr LD50 was calculated using 5-day-old normal mice (CD-1 strain), fasted for 24 hr, and gavaged with dieldrin. The LD50, 27 mg/kg, was 5% of the cumulative dose received by the dieldrin-treated, pregnant females. Acutely poisoned pups convulsed and tremored, inviable pups did not. Inviable pups were caesarian delivered on day 18 from dieldrin-treated females (po, 2 mg/kg per day, from day 6 to day 18), and aspects of carbohydrate metabolism were measured 0, 18 and 24 hr postdelivery. Inviable and control pups weighed the same at all times but the liver weights of inviable pups were reduced by 0, 8 and 21%, at 0, 19 and 24 hr, respectively (control: 61, 48, and 41 mg/g body wt). The inviable pups were hypoglycemic at delivery (0.69 *vs.* 0.95 mg/ml plasma in the controls), at 19 hr (0.53 *vs.* control values of 0.94 mg/ml), and were aglycemic at 24 hr (normal pups: 0.32 mg/ml). Liver glycogen, normal in inviable pups at birth (control: 71 mg/g liver), was reduced by 38% at 19 hr (control: 19 mg/g) and by 77% at 24 hr (control: 4.5 mg/g). Cardiac glycogen was reduced in treated pups only at 24 hr (5.5 mg/g *vs.* control levels of 11.0 mg/g). Muscle glycogen was also reduced only at 24 hr (2.2 mg/g *vs.* control levels of 5.4 mg/g). Prenatal dieldrin did not affect blood lactate, pyruvate, or urea, nor did it alter hepatic lactate dehydrogenase (LDH) or fructose diphosphatase (FDPase) activities. It is concluded that the inviability is not caused by CNS stimulation; it is associated with congenital hypoglycemia, enhanced glycogenolysis, and apparently normal gluconeogenesis. (Author abstract by permission)

80-2875. Virgo, B. B. (Dep. Biol., Univ. Windsor, Windsor, Ontario N9B 3P4, Canada) **Unilaterally ovariectomized pregnant mice: dieldrin induction of the hepatic**

monooxygenases and plasma progesterone levels. *Can. J. Physiol. Pharmacol.* 58(6): 638-642; 1980 (35 references).

Plasma progesterone, pregnancy maintenance, gestation period, and litter size were measured in mice unilaterally ovariectomized on day 6 of pregnancy (plug day = day 0) and then treated daily with dieldrin (2 mg/kg, po). By days 15-16, dieldrin had reduced the pentobarbital sleep time by 54% ($P < 0.05$), increased the liver mass by 8% ($P < 0.05$), and increased hepatic microsomal cytochrome *P*-450 by 66% ($P < 0.05$). However, the levels of plasma progesterone in the hemiovariectomized, dieldrin-treated mice were not different from those in the hemiovariectomized controls. Other experiments showed that hemiovariectomy decreased plasma progesterone by about 25%. Moreover, hemiovariectomy increased the frequency of premature delivery but it did not affect litter size; dieldrin treatment did not alter these effects. The failure of the induction to reduce plasma progesterone could result from increased progesterone synthesis compensating for its elevated metabolism or no (net) increase in progesterone metabolism. (Author abstract by permission)

80-2876. Vargova, M.; Rosival, L.; Janekova, D.; Cerey, K.; Kroman, V. (Dep. Prevent. Med., Bratislava, Czechoslovakia) **Toxikologicke hodnotenie noveho fungicidu trimoramidu. I. Akutna toxicita. [Toxicological evaluation of a new Czechoslovakian fungicide trimorfamide. I. Acute toxicity.]** *Cesk. Hyg.* 25(4): 179-184; 1980 (6 references) (Slovak).

Acute toxicity of the new Czechoslovakian fungicide trimorfamide [N-(1-formamido-2,2,2-trichloroethyl) morpholine], to be used as a spray or with irrigation water on cucumber, watermelon, tobacco fields and as spray on apple trees, some cereal crops and grapevines, was determined on Wistar rats, mice and rabbits. Both oral and dermal toxicity were found to be very low. The fungicide caused no irritation to either eyes or the skin of the animals, and did not markedly affect GPT or CHE activity or the serum creatinine level. In rats acute LD50 of the 50% wettable dust was 3950 mg/kg after oral administration and 8000 mg/kg after dermal administration. LD50 of the 20% emulsifiable concentrate was 2580 mg/kg after oral administration and 1455 mg/kg after dermal administration. LD50 of the active agent (98.8%) was 2550 mg/kg after oral and > 10,000 mg/kg after dermal administration.

80-2877. Vecchi, A.; Mantovani, A.; Sironi, M.; Luini, W.; Cairo, M.; Garattini, S. (Ist. Ric. Farmacol. Mario Negri, I-20157 Milan, Italy) **Effect of acute exposure to 2,3,7,8-tetrachlorodibenzo-*p*-dioxin on humoral antibody production in mice.** *Chem. Biol. Interact.* 30(3): 337-342; 1980 (14 references).

Young adult C57BL/6J mice were given a single ip injection of 1.2, 6 or 30 μg/kg TCDD. The primary response to thymus-dependent (sheep erythrocytes) and independent (type III pneumococcal polysaccharide) antigens was suppressed by TCDD treatment. Inhibition was still detectable 42 days after treatment. No significant affect was found on the *in vitro* blastogenic responses to Concanavalin A and bacterial lipo-polysaccharides, and the ability to mediate graft versus host reaction per unit number of lymphoid cells.

80-2878. Dudeja, P. K.; Sanyal, S. N.; Agarwal, N.; Rao, T. N.; Subrahmanyam, D.; Khuller, G. K. (Dep. Biochem., Postgrad. Inst. Med. Educ. & Res., Chandigarh 160012, India) **Acute exposure of rhesus monkeys to DDT: effect on carbohydrate metabolism.** *Chem. Biol. Interact.* 31(2): 203-208; 1980 (29 references).

Male rhesus monkeys were given single oral doses of DDT mixed with corn oil at 150 mg/kg, via stomach tube, and sacrificed 48 hr later. A 20-fold rise was noted in hepatic glycogen content, while no changes were observed in protein, RNA, DNA and lactic acid levels of the tissues. A significant increase occurred in the glycogen synthase activity, while the glycogen phosphorylase activity was reduced. Significant inhibition of adenylate cyclase, both basal and fluoride and norepinephrine stimulated activities was noted. No alterations were seen in blood glucose, urea, lactic acid contents or in the aldolase activity.

80-2879. Geyer, H.; Kraus, A. G.; Klein, W. (Ges. Strahlen & Umweltforschung, Inst. Oekologische Chem., D-8042 Neuherberg, BRD) **Relationship between water solubility and bioaccumulation potential of organic chemicals in rats.** *Chemosphere* 9(5-6): 277-291; 1980 (99 references).

In order to predict possible ecotoxicological behavior of environmental chemicals the physico-chemical properties of 34 organic compounds and 6 mixtures were investigated. Correlations between bioaccumulation factors gathered from the literature and water solubility properties were chosen for study by simple 2 variable linear logarithmic regression analysis. It was shown that organic chemicals with low water solubilities (< 50 μg/l) have the highest bioconcentration factors: 123 for mirex, 19 for DDT, 12 for hexachlorobenzene, and 10 for DDE. Biotransformation of chemicals such as methoxychlor, endosulfan and quintozene, to less lipophilic products were found to have lower bioaccumulation factors than predicted by their water solubilities. The results indicate that assessment of the bioaccumulation factors for new chemicals is advisable when their water solubilities are lower than 400 mg/1. In addition, determination of bioaccumulation in terrestrial animals would not be required if the new compound had a large molecular size that could not be absorbed or if the compound was readily biodegradable.

80-2880. Gray, C.; Knowles, C. O. (Dep. Entomol., Univ. Missouri, Columbia, MO 65211) **Uptake of propamocarb fungicide by bluegills and channel catfish.** *Chemosphere* 9(5-6): 329-333; 1980 (3 references).

A 42 *l* aerated well water aquarium at 22 ± 1°C received 250 ml/min of ^{14}C-propamocarb to maintain a 1.0 mg/1 final concentration, and a second aquarium served as control. After 2 days, 75 bluegills were added to the aquaria and 5 fish were examined on days 1, 3, 7, 10 and 14 of the depuration period. Fish were dissected into offal and fillet fractions and the tissues were analyzed by liquid scintillation spectrometry. Direct radioassay of 5 ml aliquots of aquaria water was performed throughout the study. ^{14}C-Propamocarb equivalents in fillet tissues ranged from < 0.500 (the lower detection limit) mg/kg on day 10 to 1.703 mg/kg on day 14 and in offal tissues ranged from 1.832 mg/kg on day 1 to 3.425 mg/kg on day 7. Radiolabel rapidly disappeared from both tissues during the depuration period. A second investigation on channel catfish exposed to 3.302 ng ^{14}C-propamocarb in a static water hydrosoil chamber gave concentrations ranging from 0.098 mg/kg in fillet tissue on day 1 to 1.157 mg/kg in fillet tissue on day 28. Water concentrations increased with time and soil concentrations decreased with time. Bioconcentration factors for the different tissues of each fish were calculated and it was concluded that propamocarb does not bioaccumulate or persist in these 2 fish tissues.

80-2881. Keller, W. C.; Yeary, R. A. (Toxic Hazards Div., Aerosp. Med. Res. Lab., Wright-Patterson AFB, OH 45433) **A comparison of the effects of mineral oil, vegetable oil, and sodium sulfate on the intestinal absorption of DDT in rodents.** *Clin. Toxicol.* 16(2): 223-231; 1980 (17 references).

The effects of mineral oil, vegetable oil, and sodium sulfate on the intestinal absorption of a highly lipid soluble pesticide, DDT, were compared in the rat. Intestinal absorption was evaluated by measuring recovery of DDT and metabolites in feces and the concentration of DDT in adipose tissue following oral administration of DDT and each agent. Vegetable oil was shown to significantly increase absorption of DDT when compared to all other treatments. (Author abstract by permission)

80-2882. Pritchard, M. K. (Purdue Univ., West Lafayette, IN 47907) **Plant response to light-influenced herbicides.** *Diss. Abstr. Int. B* 41(1): 10; 1980.

The influence of light on plant response to metribuzin [4-amino-6-tert- butyl-3-(methylthio) -astriazine-5(4H)one] and oxyfluorfen [2-chloro-(3-ethoxy-4-nitrophenoxy)- 4-(trifluoromethyl) benzene] was studied, and oxyfluorfen was evaluated for weed control and crop tolerance in transplanted tomato *(Lycopersicon esculentum* Mil C-28 and C-37), muskmelon *(Cucumis melo* L. Supermarket) and watermelon *(Citrullus vulgaris* L. Crimson Sweet). Periods of artificial shade before postemergence application of metribuzin reduced the tolerance of tomato more than it reduced that of jimsonweed and velvetleaf but tomato was much more tolerant to metribuzin than jimsonweed and velvetleaf. After 3 days of shade, 2 or 3 days of sunshine were required to return tomato to its full tolerance to metribuzin. Oxyfluorfen reduced electron transport in spinach *(Spinacia oleracea* L.) chloroplasts at high concentrations. However, combinations of oxyfluorfen plus dinoseb, linuron or paraquat applied to green bean *(Phaseolus vulgaris* L. Spartan Arrow) plants showed that inhibition of electron transport does not account for oxyfluorfen's herbicidal activity nor is it dependent on electron transport for activation. Preplant incorporated treatments of oxyfluorfen at 1.12 kg/ha gave good control of carpetweed *(Mellugo verticillata* L.), purslane *(Portulaca oleracea* L.), velvetleaf and yellow foxtail *(Setaria lutescens* (Weigel) Hubb.). Tomato, muskmelon and watermelon showed good tolerance to oxyfluorfen, and muskmelon and watermelon were more tolerant to the herbicide than was tomato. (Author abstract by permission. Copies of the thesis are available from University Microfilms, order No. 8015508)

80-2883. Grow, R. R. (Univ. Wyoming, Laramie, WY) **The effect of insecticide treatments on blue grama and western wheatgrass standing crop and litter accumulation, and the response of arthropod populations to herbicide treatments on a shortgrass prairie.** *Diss. Abstr. Int. B* 41(2): 456; 1980.

The effects of insecticide treatments on production of blue grama *(Bouteloua gracilis)* and western wheatgrass (*Agropyron smithii* Rydb.) and on plant litter accumulation were determined on the International Biological Program intensive study area of the Pawnee National Grasslands located near Nunn, Co. The herbicides dalapon and silvex were utilized to ascertain the effect of plant mortality on arthropod abundance. The insecticides chlorpyrifos and chlorpyrifos + methidathion treatments appeared to reduce arthropod populations. A plant matching technique determined that there was greater dry wt of above ground western wheatgrass in plots treated with insecticides than in the untreated check, whereas there were no detectable differences in above ground blue grama. Root dry wt of blue grama in the insecticide treated plots were found to be greater than those in the untreated check plots. Dry wt of plant litter also was greater on plots treated with insecticides. Arthropods were collected from areas containing fringed sagewort, *Artemisia frigida* Willd., and areas uniformly covered with blue grama grass. Abundance of aboveground arthropods decreased in areas of dead fringed sagewort (silvex treatment) relative to that in living fringed sagewort (dalapon treatment). Relatively few above ground arthropods were collected from living and dead blue grama grass. Soil macroarthropods and microarthropods were nearly eliminated from areas of blue grama after all herbicide applications. Microarthropod

densities, which decreased initially due to treatment, began to increase gradually in late summer and early fall to near normal levels. (Author abstract by permission. Copies of the thesis are available from University Microfilms, order No. 8018006)

80-2884. Roush, R. T. (Univ. California, Berkeley, CA) **Selection for insecticide resistance in *Metaseiulus occidentalis* (Nesbitt) (Acarina: Phytoseiidae): genetic improvement of a spider mite predator.** *Diss. Abstr. Int. B* 41(1): 61-62; 1980.

A genetic improvement project to genetically select and field test insecticide resistant strains of *Metaseiulus occidentalis* (Nesbitt), an important spider mite predator, is in progress. Strains were selected for resistance to methomyl, dimethoate, and carbaryl using 2 different selection methods. Twelve rounds of selection with methomyl gave a ca. 12× selection response. Ten rounds of selection with dimethoate yielded 2 strains 2-32× more resistant than field-collected strains, the genetic basis of which was determined to be multifactorial. A high level of carbaryl resistance was achieved after 18 rounds of selection. *M. occidentalis* response to carbaryl is variable, which complicates its quantification. However, as tested by a new leaf flood method at 2.4 g/l AI concentration of carbaryl, ca. 85% of the adult females of the selected strains survive compared to ca. 2% in unselected strains. Carbaryl resistance appears to be determined by a single dominant gene, which is optimal for its establishment in the field. The carbaryl resistance gene *(Carb)* is present in low frequencies (ca. 0.004) in field populations, but carbaryl resistance has not yet developed in the field, probably because of the great variability in *M. occidentalis* response to carbaryl and or because acaricide applications eliminate prey and starve resistant *M. occidentalis* after carbaryl treatments. Laboratory and greenhouse tests were concluded to assess the vigor and reproductive compatibilities of the 2 laboratory-selected carbaryl resistant strains of *M. occidentalis.* Traits evaluated included development time, fecundity, sex ratio, mating compatibility and competition, diapause, resistance to pesticides other than carbaryl, persistence of the carbaryl resistance characteristic, and the capacity to control spider mite populations under carbaryl sprayed and unsprayed conditions The resistant strains did not differ from the susceptible strains tested to any degree that could be considered biologically significant. Laboratory-selected carbaryl resistant *M. occidentalis* were released into 2 San Joaquin Valley almond orchards in 1979 where they survived carbaryl applications and controlled spider mite populations. Data from predators collected in 1979 from a 1978 release site suggest that the carbaryl resistance can persist from year to year. If carbaryl resistance continues to persist in the field, this will be the first successful laboratory-selected genetic improvement of the field effectiveness of a biological control agent. (Author abstract by permission. Copies of the thesis are available from University Microfilms, order No. 8014863)

80-2885. Hansten, P. D. (Coll. Pharm., Washington State Univ., Pullman, WA 99164) **Oral anticoagulants and drugs which alter thyroid function.** *Drug Intell. Clin. Pharm.* 14(5): 331-334; 1980 (9 references).

Drug interactions occur in patients on long-time warfarin therapy in whom thyroid replacement is begun. Warfarin reduces the production of effective vitamin K dependent clotting factors such as II, VII, IX and X, but does not affect the rate of catabolism. In patients with normal thyroid function, warfarin at the standard dose will in general reduce the level of circulating clotting factors to a therapeutic level. Hyperthyroid patients receiving warfarin experience decreases in clotting factor synthesis along with hyperthyroidism induced increases in clotting factor catabolism, which enhances the anticoagulant response. In hypothyroiditics there is a decrease in the catabolism of vitamin K-dependent clotting factors, but there appears to be a concomitant decrease in clotting factor synthesis. In patients found to be hypothyroid after the initiation of warfarin, the administration of thyroid replacement therapy increases the catabolism of the clotting factors to normal. This normalization in the presence of large warfarin doses will cause excessively low levels of circulating clotting factors, and an increased likelihood of bleeding.

80-2886. Anonymous **Methylenedioxyphenyl metabolism.** *Drug Metab. Dispos.* 8(4): 284; 1980 (2 references).

Incubation of 2 m*M* piperonyl butoxide, methylenedioxybenzene (MDB), or the 4-methyl, 4-methoxy, or 4-hydroxymethyl derivatives of MDB with rat liver microsomes and an NADPH generating system resulted in formation of CO at the rate of 0.2-0.3 nmol/min or less. CO formation took place at a ten-fold higher rate with the halo, hydroxy and cyano derivatives of MDB as well as methylenedioxynaphthalene. The latter compounds yielded type I difference spectra when incubated with rat liver microsomes, but gave a single band at about 459 nm after NADPH addition. This band shifted to 451.4 nm as O_2 was depleted. The first group of compounds also gave type I difference spectra when added to microsomes, and addition of NADPH caused appearance of a type III spectrum with peaks at 429 and 459 nm. Addition of dithionite changed the spectra to those with Soret peaks at 427 and 455 nm, and subsequent addition of hemoglobin caused no further spectral change. When hemoglobin was added to the more active CO-producing system, the spectral peak at 451.5 nm disappeared and one appeared at 419 nm, characteristic of carboxyhemoglobin.

80-2887. Anonymous **Reductive dechlorination of DDT.** *Drug Metab. Dispos.* 8(4): 284-285; 1980 (1 reference).

Attempts were made to characterize the enzymic and nonenzymic systems that convert DDT to DDD (TDE)

in rat liver microsomes. In the rat liver 20,000*g* supernatant fraction, dechlorination of DDT occurred only under anaerobic conditions. Addition of cofactors tripled the amount of DDD formed (reduction of DDT took place at the rate of 5% of the substrate in 2 hr in the absence of cofactors). The effects of FAD and NADPH were additive when both were used, but the extent of reduction in the presence of riboflavin plus NADPH was the same as with either alone. In the presence of NADPH plus FAD, the microsomal fraction reduced over half the substrate in 2 hr and thus had an activity 2.5-3 times greater than that of 10,000*g* pellet, 10,000*g* supernatant fraction, and 105,000*g* supernatant fraction. Heating the microsomes at 90°C for 10 min before incubation decreased NADPH-supported reduction much more than the FAD-supported reduction. Thus there seem to be at least two enzyme systems active in DDT reduction in rat liver microsomes under anaerobic conditions. One appears to involve cytochrome P-450, and the other seems to be a flavoprotein-flavin system. DDT reduction therefore appears similar to nitro and azo reduction.

80-2888. Farkas, I.; Szak, J.; Strohmayer, A.; Desi, I. (Author address not given) **Comparative studies on EEGs of pilots in plant protection service.** *Electroencephalogr. Clin. Neurophysiol.* 49(3-4): 64-65; 1980.

Electroencephalograms were prepared on 30 pilots employed in spraying cholinesterase-inhibiting compounds. Recordings were made before and after spray operations using bilateral temporo-temporal leads. Tracings were recorded on magnetic tape and subjected to harmonic analysis. The values for each waveband were measured using an integrator, then plotted. The brain electrical activity showed a global increase after spraying. The observed significant alteration of the EEG calls for additional studies.

80-2889. Ali, M. S.; Rahmatullah, M.; Jahan, R.; Yusul, H. K. M.; Chowdhury, A. A. (Dep. Biochem., Univ. Dacca, Dacca 2, Bangladesh) **Effect of DDVP (insecticide) on citric acid fermentation in *Aspergillus niger*.** *Enzyme Microb. Technol.* 1(2): 127-128; 1979 (17 references).

Aspergillus niger strain CA/16 was exposed to DDVP (dichlorvos) dissolved in a small volume of ethanol and added to the culture medium giving final concentrations of 10, 20, 30, 40, 50, 60, 70, 80 and 90 μg/ml. Incubation was maintained at 37° C for up to 192 hr. Germination occurred in control flasks within 36 hr of incubation. In the DDVP-containing medium, germination occurred after 120 hr. In control flasks citric acid production occurred after 96 hr, reaching maximum levels at 144 hr. In flasks containing at least 80 μg/ml DDVP the first appearance of citric acid was after 192 hr. The insecticide also delayed uptake of inorganic phosphate by the mycelium. These findings suggest that DDVP does not destroy the citric acid-producing mechanisms of *A. niger*, but does delay the process until it is degraded by the cells.

80-2890. Pushpendran, C. K.; Devasagayam, T. P. A. (Biol. Group, Bhabha At. Res. Cent., Bombay 400085, India) **The metabolic fate of [^{35}S]-diallyl disulfide in mice.** *Experientia* 36(8): 1000-1001; 1980 (17 references).

Diallyl disulfide (DADS) is a major constituent of garlic oil, and has been shown to have insecticidal and fungicidal properties. Uptake of [^{35}S]-labelled diallyl disulfide by mouse liver is highest at 90 min after treatment. Two hr after treatment with [^{35}S]-DADS, 70% of the radioactivity is present in the liver cytosol, of which 80% is metabolized to sulfate. (Author abstract by permission)

80-2891. Anonymous **Recommended methods for the detection and measurement of resistance of agricultural pests to pesticides. Method for adult aphids, FAO Method No. 17.** *FAO Plant Prot. Bull.* 27(2): 29-32; 1979 (4 references).

A rapid-dip test is presented in which batches of aphids are immersed in various concentrations of aqueous preparations for periods of 10 sec. The aphids are then partly dried, and maintained in a clean environment for an hour or longer before mortality counts are started. A second method presented calls for spraying of leaves of suitable host plants in the Potter tower to yield a constant liquid deposit with varying concentrations of insecticide. After 2 hr drying time, glass cells are fixed to them, and mortality counts are made 24 hr after the insecticide was sprayed.

80-2892. Anonymous **Recommended methods for the detection and measurement of resistance of agricultural pests to pesticides. Method for *Lygus* plant bugs - FAO method No. 18.** *FAO Plant Prot. Bull.* 27(2): 33-36; 1979 (7 references).

Healthy specimens of adult *Lygus* plant bugs were treated with 1-μl droplets of acteone solutions of insecticides. The droplets were applied to the coxal region. The insects were then held at 25-26°C on fresh green beans for 24 hr before mortality counts were started. A base-line was established from which a diagnostic dose could be determined with a high probability of killing all of a sample of normal insects. This data could then be used to monitor for developing resistance.

80-2893. Anonymous **Recommended methods for the detection and measurement of resistance of agricultural pests to pesticides. Tentative method for mite pests of**

stored products (e.g., *Acarus siro* L) - FAO method No. 19. *FAO Plant Prot. Bull.* 27(2): 37-39; 1979 (2 references).

The method described for measuring resistance in mites has been used in the United Kingdom for such tests among *Acarus siro* and *Glycyphagus destructor.* Wheat measuring about 16% moisture content is mixed with dust containing various concentrations of acaricide. Storage is maintained at 17.5°C for a period of 24 hr. Humidity is maintained at 75%. The mixture is divided into 50 g lots, into which 0.01 g of mites are placed. After 14 days a rough estimation of percentage kills is made.

80-2894. Anonymous **Recommended methods for the detection and measurement of resistance of agricultural pests to pesticides. Method for tephridid fruit flies - FAO Method No. 20.** *FAO Plant Prot. Bull.* 27(2): 40-43; 1979 (9 references).

The method described has been used to measure the toxicity of a range of insecticides against *Dacus dorsalis, D. cucurbitae* and *Ceratitis capitata* in Hawaii, and also against *D. oleae* in Greece, and *Rhagoletis pomonella* in the United States. Fruit flies of known susceptibility are immobilized and treated topically with 1 µl drops of insecticides in acetone solution. After 24 hr at 25°C the percentages killed are determined, and from this data the median lethal dose is established. When flies survive the diagnostic dose, it is time for additional testing and a confirmation of resistance factors.

80-2895. Anonymous **Recommended methods for the detection and measurement of resistance of agricultural pests to pesticides. Method for the diamond-back moth (*Plutella xylostella* L) - FAO Method No. 21.** *FAO Plant Prot. Bull.* 27(2): 44-46; 1979 (4 references).

A method for the detection of resistance of *Plutella xylostella* L to insecticides is described. A batch of 4th instar larvae are anesthetized and exposed to droplets of acetone solutions of insecticides. Larvae are then placed on cabbage or cauliflower leaves in glass jars and kept at 25°C for 4 days. The percentage killed enables base-line data to be obtained from which a diagnostic dose can be selected. This diagnostic dose is used for monitoring resistance. When there are survivors of subsequent tests using this diagnostic dose, such survivors serve as a warning that additional testing is needed.

80-2896. Anonymous **Recommended methods for the detection and measurement of resistance of agricultural pests to pesticides. Method for lepidopterous larval pests of stored method for detecting resistance in adults of stored-product lepidopterous pests - FAO method No. 22.** *FAO Plant Prot. Bull.* 27(2): 47-51; 1979.

Last-instar larvae of normally susceptible lepidopterous pests of products are treated by topical exposure to 1 µl drops of insecticide in acetone solution. The larvae are then stored at 27 for 120 hr in 45-65% humidity. The percent killed allows computation of a diagnostic dose which can be selected to have a high probability of killing normal insects. Survival at this dose level indicates the occurrence of resistance among the insects and necessitates further study. For tests of adult moths, the insects are collected and transferred to 250 ml glass flasks, previously treated with films of insecticide. After 6 hr the knockdown percentages are calculated and a diagnostic concentration selected.

80-2897. Anonymous **Recommended methods for the detection and measurement of resistance of agricultural pests to pesticides. Method for whiteflies (e.g., *Trialeurodes vaporariorum* Westw.) and tentative method for detecting resistance in adult whiteflies. FAO method No. 23.** *FAO Plant Prot. Bull.* 27(2): 52; 1979.

Plants, heavily infested with whitefly, were caged along with young french beans or cotton plants. When these plants were removed from the cages, all adults were removed from them and all eggs were allowed to remain until scales developed. Leaves were then dipped in aqueous preparations of insecticides or sprayed using a Potter tower. Treated plants were then kept at 22-23 for 1 wk. Percent kill was used to determine a diagnostic dose, and used to screen samples of whitefly populations for resistance. The tentative method for adult resistance requires batches of about 50 whiteflies sprayed in a Potter tower operated at 42 kPa using 2 ml of insecticide preparation. Treated adults are then placed into a beaker containing two bean leaves. Adult mortality is assessed after 24 hr and the diagnostic dose is then determined.

80-2898. Luthy, P. (Inst. Microbiol., Swiss Fed. Inst. Technol., CH-8092 Zurich, Switzerland) **Insecticidal toxins of *Bacillus thuringiensis.*** *FEMS Microbiol. Lett.* 8(1): 1-7; 1980 (23 references).

Most of this review centers on the δ-endotoxin metabolite of *Bacillus thuringiensis.* Although the insecticidal properties of *B. thuringiensis* have been known for some time, its field application has been developed recently. *B. thuringiensis* products are toxic due to the δ-endotoxin forming during the sporulation process. The crystal is a protoxin, does not show biological activity, and is composed of subunits. Glutamic and aspartic acids account for more than 20% of the amino acid composition of the crystal and there is a possibility that carbohydrates are incorporated into the crystal as impurities during the sporulation process. The crystals are extremely insoluble, have molecular weights between 177,000 and 230,000 and have dimer subunits. The activation of the protoxin takes place under natural conditions in the intestine of host insects. The primary site of action is the gut epithelium with

the first symptoms appearing within a few minutes. The molecular mode of action is not known.

80-2899. Klika, E.; Kunc, L.; Antalikova, L.; Kuncova, M. (Dep. Histol., Fac. Med., Charles Univ., Prague, Czechoslovakia) **The morphology of the lung in the albino rat after paraquat administration.** *Folia Morphol. (Prague)* 28(2): 188-191; 1980 (12 references).

Wistar rats were given a 30 mg/kg dose of paraquat, and lung tissue was examined 1, 2, 3, 4, 6, 8, 9, 11, and 12 hr later. Marked structural changes appeared in the terminal respiratory segment 8-12 hr after administration. Necrotic changes in the alveolar epithelium, edema, hemorrhage and alveolar collapse were noted. The acute necrotic effects were projected strongly in the pathophysiological findings.

80-2900. Matkovics, B.; Szaro, L.; Mindszenty, L.; Ivan, J. (Biol. Isotope Lab., A.J. Univ. Szeged, Szeged, Hungary) **The effects of organophosphate pesticides on some liver enzymes and lipid peroxidation.** *Gen. Pharmacol.* 11(4): 353-355; 1980 (15 references).

Sumithion (fenitrothion; 800 mg/kg, ip) was administered as a single dose to vitamin A-deficient and control inbred female rats of the CFY strain. Trichlorfon (150 mg/kg) was also given. Prior to organophosphate administration the ChE activity of the vitamin-A deficient rats was nearly 50% that of the controls. After organophosphate dosing these levels decreased still further in the vitamin-A deficient rats. Both organophosphates increased superoxide dismutase (SOD) activity in control animals, whereas trichlorfon decreased and sumithion increased SOD activity in the vitamin-A deficient animals. Catalase activity was increased by trichlorfon in both test groups, while sumithion increased it only a little, or had no effect at all. The lipid peroxidation increased in controls exposed to organophosphates, but decreased or remained unchanged in vitamin-A deficient animals. Protein and cytochrome P-450 values rose in animals treated with either pesticide in comparison to untreated controls. Protein and cytochrome P-450 values decreased in the liver homogenates of animals which were both vitamin A-deficient and exposed to the organophosphates.

80-2901. Barnes, P. T. (Univ. Minnesota, Minneapolis, MN) **Balancing selection and inversion polymorphism in a DDT resistant population of *Drosophila melanogaster*.** *Genetics* 94(4PT4): S7; 1980.

Various types of selection which might be involved in maintaining an inversion polymorphism in a laboratory population of *Drosophila melanogaster* highly resistant to DDT were investigated. The inversion is present in the population at a frequency of 45%. The polymorphism was stable. Relationships among three karyotypes for various components of fitness were studied. Egg-to-adult viability in the presence of DDT was analyzed. Heterokaryotype advantage was indicated. Significant differences between the homokaryotypes were noted at fecundity, fertility and developmental rates. Frequency-dependent selection and selection favoring different karyotypes at different stages of the life cycle were excluded. It is suggested that the predominant balancing force resides in the heterokaryotype advantage for survival in the presence of DDT.

80-2902. Galloway, R. E.; Mets, L. (Case Western Reserve Univ., Cleveland, OH) **A uniparental mutant of *Chlamydomonas reinhardii* resistant to the herbicide DCMU.** *Genetics* 94(4PT4): S35; 1980.

Positive selection on DCMU (diuron) containing media led to the isolation of a DCMU-resistant mutant of *Chlamydomonas reinhardii*. Uniparental transmission patterns are demonstrated which imply a chloroplast gene mutation. The mutant required a 20-fold higher DCMU concentration to give a level of inhibition comparable to the wild type. The mutant was also slightly resistant to atrazine. Simultaneous inheritance of resistant growth and resistant thylakoid membrane PSII activity were demonstrated.

80-2903. Pfaffenberger, C. D.; Peoples, A. J.; Enos, H. F. (Dep. Epidemiol. & Public Health, Chem. Epidemiol. Div., Sch. Med., Univ. Miami, Miami, FL 33177) **Distribution of volatile halogenated organic compounds between rat blood serum and adipose tissue.** *Int. J. Environ. Anal. Chem.* 8(1): 55-65; 1980 (25 references).

The metabolism, distribution, storage, and elimination of volatile purgeable halogenated hydrocarbons (VPHH) was examined in male Sprague-Dawley rats dosed with varying amounts of chloroform, trichloroethylene, carbon tetrachloride, and bromodichloromethane on a 31-day schedule. Dosing was done by gavage, and animals were sacrificed at different periods to obtain samples of adipose tissue and blood serum. Purge/trap/desorb techniques were employed using a combination of liquid sampling concentrating, GLC, and electrolytic conductivity detection. GC/MS was used for compound identifications. All of the compounds studied were detected in tissue samples to varying degrees, but none of them showed increased storage with time. The ratio of adipose tissue levels to blood serum levels never deviated by more than a factor of 3. Complete volatilization of the VPHH occurred from the tissues examined within 3-6 days after dosing was terminated. Trichloroethylene and carbon tetrachloride were metabolically converted to chloroform and/or a chloroform precursor. In animals dosed with bromodichloromethane, serum chloroform concentrations remained below those of control rats. Unlike less volatile

organochlorine compounds such as DDT and DDE, the VPHH compounds do not accumulate in adipose tissue upon regular dosing, then decline slowly after administration has stopped. The rapid elimination of VPHH compounds from the rat body may be explained by their low vapor pressures, favoring elimination via expiration, and their low water/air partitioning coefficients.

80-2904. Oehler, D. D.; Ivie, G. W. (Vet. Toxicol. & Entomol. Res. Lab., Agric. Res., SEA, USDA, College Station, TX 77840) **Metabolic fate of the herbicide dicamba in a lactating cow.** *J. Agric. Food Chem.* 28(4): 685-689; 1980 (11 references).

The herbicide dicamba (Banvel, 3,6-dichloro-2-methoxybenzoic acid) was rapidly absorbed, only partly metabolized, and rapidly excreted by a lactating cow after oral treatment during a 5-day period at a dose equivalent to 2.2 mg/kg/day or about 60 ppm of dietary dicamba. Within 6 hr after the final [^{14}C] dicamba dose, about 89% of the administered ^{14}C had been excreted in the urine, <2% in the feces, and about 0.02% in the milk. The excreted radiocarbon was primarily unchanged dicamba (about 80%), but the compound was metabolized by aryl-*O*-demethylation to 3,6-dichloro-2- hydroxybenzoic acid (DCHBA), which was the major metabolite in urine and in extracts of feces and tissues and was the only radioactive component extracted from milk. Minor metabolites identified in urine were 2,5-dichlorophenol and the glucuronide conjugate of DCHBA. Results in these studies suggest that low-level exposure of ruminants to dicamba through contaminated feed, forage, or water will not result in appreciable retention of residues by edible tissues or their secretion into milk. (Author abstract reprinted by permission of the American Chemical Society)

80-2905. Belasco, I. J.; Harvey, J., Jr. (Exp. Stn., Biochem. Dep., E. I. du Pont de Nemours & Co. Inc., Wilmington, DE 19898) ***In vitro* rumen metabolism of ^{14}C-labeled oxamyl and selected metabolites of oxamyl.** *J. Agric. Food Chem.* 28(4): 689-692; 1980 (4 references).

The metabolism of radiolabeled oxamyl, methyl *N′,N′*-dimethyl-*N*-[(methylcarbamoyl)oxy]-1-thio-oxaminidate-1 ^{14}C, by rumen microorganisms, *in vitro*, was rapid. Essentially all (99%) of the oxamyl had been metabolized within 6 hr. The major metabolites after 24 hr of incubation were methyl *N*-hydroxy-*N′*, *N′*-dimethyl-1- thio-oxaminidate and *N,N*-dimethyl-1-cyanoformamide (DMCF), which accounted for 80% of the residual radioactivity. Separately, the *in vitro* rumen metabolism of metabolite A, the glucose conjugate of methyl *N*-hydroxy-*N′*, *N′*-dimethyl-1- thioxamimidate, yielded DMCF. In turn, DMCF was found to metabolize to *N,N*-dimethyloxamide, *N,N*-dimethyloxamic acid, and *N*-methyloxamic acid. All the metabolites isolated and characterized, except for *N,N*-dimethyloxamide, were identical with those previously demonstrated in the rat. (Author abstract reprinted by permission of the American Chemical Society)

80-2906. Akhtar, M. H.; Foster, T. S. (Anim. Res. Inst., Res. Branch, Agric. Canada, Ottawa, Ontario K1A 0C6, Canada) **Fate of tetrachlorvinphos and its isomer in soluble fraction (105,000 *g*) from goose and turkey liver homogenates.** *J. Agric. Food Chem.* 28(4): 693-697; 1980 (15 references).

Incubation of tetrachlorvinphos [(*Z*)-2-chloro-1-(2,4,5-trichlorophenyl) vinyl dimethylphosphate] with the soluble fraction (105,000 *g*) from goose and turkey liver produced 2,4,5-trichlorphenacyl chloride, 2,4,5-trichloroacetophenone, 1-(2,4,5-trichlorophenyl)ethanol, 2-chloro-1-(2,4,5-trichlorophenyl) ethanol, and (2,4,5-trichlorophenyl) ethanediol (goose only) via desmethyl tetrachlorvinphos. Isomerization of the insecticide to the *E* isomer occurred in glutathione deficient enzyme systems and was found to be more pronounced in turkey liver systems. The *E* isomer was degraded by the enzyme systems at a slow rate and probably involved a P−O−vinyl hydrolytic cleavage which was catalyzed by an enzyme which did not require glutathione as a cofactor. (Author abstract reprinted by permission of the American Chemical Society)

80-2907. Akhtar, M. H.; Foster, T. S. (Anim. Res. Inst., Res. Branch, Agric. Canada, Ottawa, Ontario K1A 0C6, Canada) **Metabolism and excretion of tetrachlorvinphos in dairy cows.** *J. Agric. Food Chem.* 28(4): 698-704; 1980 (14 references).

Metabolism and excretion of tetrachlorvinphos were studied in dairy cows after oral administration for 5 days, followed by no treatment for a 10 day period. Orally administered tetrachlorvinphos (50 ppm, based on average daily ration intake) was absorbed, extensively metabolized, and almost totally eliminated in 10 days following the end of treatment. Traces of unchanged insecticide were detected in urine. The metabolites identified in hydrolyzed urine were as follows: desmethyl tetrachlorvinphos (13.2%), 1-(2,4,5-trichlorophenyl)ethanol (34.8%), (2,4,5-trichlorophenyl) ethane-1,2-diol (28.1%), and 2,4,5-trichloromandelic acid (6.1%). In addition, unchanged insecticide (7.1%) as well as significant amounts of 1-(2,4,5-trichlorophenyl)ethanol (8.7%) were excreted in the feces. Neither unchanged insecticide nor metabolites could be detected in milk and various tissues from treated lactating cows. (Author abstract reprinted by permission of the American Chemical Society)

80-2908. Borsetti, A. P. (Div. Chem. & Phys., US FDA, Washington, DC 20204) **Determination of pen-**

tachlorophenol in milk and blood of dairy cattle. *J. Agric. Food Chem.* 28(4): 710-714; 1980 (20 references).

Rapid, similar analytical methods are presented for the determination of pentachlorophenol (PCP) residues in milk and blood from dairy cattle. The method for milk employs a hexane/2-propanol extraction, base partition and wash, reacidification, and extraction with hexane; for blood PCP is extracted from acidified solution with hexane. The PCP is then determined, underivatized, by gas-liquid chromatography on a 2% SP1000/1% H_3PO_4 column with electron-capture detection. The identity of PCP is confirmed by treatment with diazomethane and gas chromatography of the pentachloroanisole derivative. Recoveries were >90% for milk and >87% for blood over a range of fortification levels. The limit of quantitation is 4 ppb for milk and 10 ppb for blood. The limit of detection for both substrates is 1.0 ppb. Details of method optimization and its application to the analysis of milk containing bioincurred residues of PCP are discussed. (Author abstract reprinted by permission of the American Chemical Society)

80-2909. Feroz, M.; Khan, M. A. Q. (Dep. Biol. Sci., Univ. Illinois, Chicago, IL 60680) **Metabolic fate of *cis*-photochlordane in the rat. 1. Excretion, tissue distribution, and preliminary characterization of metabolites.** *J. Agric. Food Chem.* 28(4): 740-745; 1980 (18 references).

Male rats treated orally, or ip, with 3.12 mg of *cis*-photochlordane/rat cumulatively excreted, respectively, about 86 and 88% of the dose in 3 wk. The half-life of the compound was less than 1 day in orally treated and about 7 days in ip treated rats. Highest concentration of the residues at the end of the 3 wk was found in fat. Ip treated rats showed higher residual radioactivity in all tissues. Analyses of the organic extracts of feces and urine from the treated rats showed at least 22 compounds in the former and 15 compounds in the latter. These metabolites were isolated, purified, and chromatographically characterized. (Author abstract reprinted by permission of the American Chemical Society)

80-2910. Rosen, J. D.; Schuphan, I.; Segall, Y.; Casida, J. E. (Dep. Food Sci., Cook Coll., Rutgers Univ., New Brunswick, NJ 08903) **Mechanism for the mutagenic activation of the herbicide sulfallate.** *J. Agric. Food Chem.* 28(4): 880-881; 1980 (15 references).

The carcinogenic herbicide *S*-(2-chloroallyl) diethyldithiocarbamate (sulfallate) is metabolized *in vitro* to 2-chloroacrolein, a potent and direct-acting mutagen in the *Salmonella typhimurium* assay, using strain TA 100. Although not identified, the proximate mutagen may be formed by hydroxylation of sulfallate or one of its dithio- or thiocarbamate metabolites at the methylene group adjacent to the sulfur. (Author abstract reprinted by permission of the American Chemical Society)

80-2911. Wade, N. L.; Rigney, C. J. (CSIRO Div. Food Res., New South Wales Dep. Agric., North Ryde, New South Wales 2113, Australia) **Phytotoxicity of ethylene dibromide to cherry and banana fruit.** *J. Am. Soc. Hortic. Sci.* 104(6): 900-900; 1979 (18 references).

Studies using cherries and bananas were carried out as part of a program designed to develop a dose of ethylene dibromide (EDB) that was effective against fruit flies, but not phytotoxic. Cherries were fumigated with EDB (0.44 g/m³) for 2 hr at 20°C. Fruit was placed in jars ventilated with moist air, and rates of respiration and ethylene (C_2H_4) evolution were determined by analysis of the effluent airstream. Bananas were similarly fumigated and placed in respiration jars. In addition, electrolyte leakage was estimated in banana pulp tissue bathed in aerated deionized water, by measuring the conductivity of the bathing solution before and after boiling the suspension for 10 min. EDB at 4 g/m³ stimulated C_2H_4 evolution and respiration in cherries, while higher concentrations of 32 g/m³ or more caused proportionately greater increases in the rates of gas exchange. Since cherries stored at 1°C after fumigation did not display increases in gas exchange, but did develop severe symptoms of phytotoxicity, it was determined that increases in gas exchange were effects and not causes of EDB injury. Pretreatment of cherries with Co^{2+} reduced C_2H_4 production, indicating that EDB affects the methionine pathways of ethylene synthesis. In bananas treated with 32 g/m³, respiration, C_2H_4 evolution, and electrolyte leakage increased.

80-2912. Cook, A. G.; Critchley, B. R.; Critchley, U.; Perfect, T. J.; Yeadon, R. (Cent. Overseas Pest Res., London W8 5SJ, England) **Effects of cultivation and DDT on earthworm activity in a forest soil in the sub-humid tropics.** *J. Appl. Ecol.* 17(1): 21-29; 1980 (16 references).

Studies on the effects of cultivation and DDT treatments on earthworm activity were studied, in 12, 24 × 12 m, randomized block design plots. Three plots were left in thicket and 9 were cultivated with cowpea. Three of the cultivated plots received 10 applications of 1 kg DDT/ha in each of the growing seasons; 3 received weekly DDT applicaions in only one growing season; and 3 plots received no DDT. The experiment continued for 4 yr. Earthworm casting rates were determined for each plot as a measure of earthworm activity. Castings were also analyzed for weight and chemical content. Castings were deposited by two genera of earthworms. *Eudrilus* sp activity was low in the uncleared plots, but increased each yr in untreated cultivated plots. Their activity remained low in the DDT treated plots. The activity of *Hyperidodrilus* sp was reduced in all cultivated plots compared with the brush plots. There were no reductions in the biomass of worms as a result of the DDT applications.

80-2913. Adeney, P. J.; Matthiessen, P. (Cent. Overseas Pest Res., Overseas Dev. Adm., London W8 5SJ, England)

Sub-lethal effects of the organophosphate blackfly larvicide, Abate (temephos) on *Sarotherodon mossambicus* (Peters). *J. Fish Biol.* 15(5): 545-552; 1979 (21 references).

Trout *(Sarotherodon mossambicus)* kept in aquaria treated with Abate (temephos) by a daily slug dose (0.696 g/dm^3) for 10 wk showed no significant changes in growth patterns when compared to blank treated controls. *S. mossambicus* exposed to 0.1 mg Abate/dm^3 for 16 days also showed no significant differences from control fish when examined for plasma glucose and hemoglobin levels, or plasma Na^+ and K^+ electrolytes. When trout brain homogenates were incubated for 0, 20, 40, 80 or 160 min at 27°C with levels of Abate equal to 10 times that found in the brain tissue of *S. mossambicus* after 78 days exposure to daily slug-doses of 0.05 mg Abate/dm^3, no significant increases in AChE activity were found. Abate also failed to produce significant reductions in AChE activity in *in vivo* experiments where trout were exposed to 0.1 mg AI/dm^3 for up to 16 days. The lack of toxic effects of Abate to *S. mossambicus* at levels at which other organophosphates are toxic may be due to the fact that AChE inhibition is only caused by the oxygen analogues of Abate, but not the parent molecule.

80-2914. Leatherland, J. F.; Sonstegard, R. A. (Dep. Zool., Coll. Biol. Sci., Univ. Guelph, Guelph, Ontario, Canada) **Effect of dietary Mirex and PCB's in combination with food deprivation and testosterone administration on thyroid activity and bioaccumulation of organochlorines in rainbow trout *Salmo gairdneri* Richardson.** *J. Fish Dis.* 3(2): 115-124; 1980 (13 references).

Rainbow trout were fed either a control diet or one of the following experimental diets: PCB's (500 or 50 mg/kg), mirex (500, 50 or 5 mg/kg), or a mixed PCB (50 mg/kg) plus mirex (50 mg/kg) diet. The fish were already accustomed to a 12 hr light: 12 hr dark photoperiod. Sampling was carried out between 7 and 9 hr after the start of the photoperiod. Serum thyroid hormone levels were significantly lowered in trout fed high mirex, 5000 mg/kg dry feed or high PCB, 500 mg/kg, diets. Low dietary levels of PCB's or mirex (50 or 5 mg/kg) had no effect on thyroid hormone levels. The mixed diet caused significantly elevated T3 levels, but only after starvation and subsequent testosterone administration. Trout fed the high PCB diet had 5-fold higher carcass PCB levels than those given the low PCB diet. There were only 4.56 and 1.35-fold increases in carcass content of mirex despite a 10-fold increase in dietary mirex.

80-2915. Satyanarayana, M. M.; Rao, M. V. L. (Cent. Food Technol. Res. Inst., Mysore, India) **Some contributions to biochemistry in relation to food science and technology.** *J. Food Sci. Technol.* 17(1-2): 106-111; 1980.

Major areas of research and findings over the past 30 yr in the field of food science and technology are reviewed. Specific mention is made of metabolic studies of two rodenticides, norbormide and α-naphthyl thiourea (ANTU). Norbormide causes a 100% increase in blood glucose levels of rats given 1-2 mg/100 g body wt. ANTU causes uremia and hyperglycemia. Studies have demonstrated that tricalcium phosphate is ingested by the insect larvae, causing glycogen and fat depletion. Insect larvae of *Corcyra cephalonica* have been used to develop a sensitive biological method for the assay of the toxic components present in gaur bean meal.

80-2916. Nagler, J.; Braeckman, R. A.; Willems, J. L.; DeBroe, M. E. (Dep. Intensive Care, Algemeen Ziekenhuis Middelheim, Middelheim, Belgium) **Combined hemoperfusion-hemodialysis in organic phosphate poisoning.** *Kidney Int.* 18: 139; 1980.

A 34-yr-old female ingested 10 g of dimethoate in a suicide attempt and was admitted to the hospital 0.5 hr later. Serum concentration upon admission was 2340 ng/ml. After the start of conventional therapy serum dimethoate levels rose to 3110 ng/ml. Hemoperfusion combined with hemodialysis therapy was started and after 18 hr no dimethoate was detected in the serum. Hemodialysis and hemoperfusion allowed correction of hypothermia and fluid imbalance, adjustment of serum electrolytes and prevention of rebound phenomena. [Presented at the 1980 meeting of the French Society of Nephrology]

80-2917. Shiau, S. Y.; Huff, R. A.; Wells, B. C.; Felkner, I. C.* (Dep. Biol. Sci., Texas Tech. Univ., Lubbock, TX 79409) **Mutagenicity and DNA-damaging activity for several pesticides tested with *Bacillus subtilis* mutants.** *Mutat. Res.* 71(2): 169-179; 1980 (20 references).

The active pure compounds of 4 pesticides were tested for DNA-damaging and mutagenic activity in *Bacillus subtillis* and *Salmonella typhimurium* tester strains. Included were zinc ethylenebisdithiocarbamate (dithane; zineb), 1,2-dihydropyridazine-3,6-dione (maleic hydrazide), *O*-dimethylphosphorodithioate (malathion), and 1,2-dibromethane (fumazone; ethylene dibromide). These agents gave either weak or negative mutagenic responses with the Salmonella/microsome tests for mutagenicity, but were all positive when the tester was *B. subtilis* strain *TKJ*6321. Of the 4 chemicals, only fumazone required metabolic activation with rat-liver S9 mix. Upon activation, it produced a volatile mutagenic product. Dithane, maleic hydrazide, and malathion were all mutagenic and did not require metabolic activation. Among these agents, dithane was strongly mutagenic while fumazone, maleic hydrazide and malathion were moderately mutagenic. Only dithane gave significant DNA-damaging activity when applied to a battery of repair-deficient *B. subtilis* mutants. For the chemicals reported, it is concluded that *B. subtilis* is superior to *B. typhimurium* in the detection of mutagenic activity. We strongly recom-

mended its use for prescreening procedures in combination with the *S. typhimurium* testers. (Author abstract by permission)

80-2918. Bartsch, H.; Malaveille, C.; Camus, A.-M.; Martel-Planche, G.; Brun, G.; Hautefueille, A.; Sabadie, N.; Barbin, A.; Kuroki, T.; Drevon, C.; Piccoli, C.; Montesano, R. (IARC, F-69372 Lyon Cedex 2, France) **Validation and comparative studies on 180 chemicals with *S. typhimurium* strains and V79 Chinese hamster cells in the presence of various metabolizing systems.** *Mutat. Res.* 76(1): 1-50; 1980 (131 references).

Results from tests on a total of 180 compounds in the *Salmonella* microsome assay and its adapted procedures are summarized. The following specific problems were analyzed: the predictive value of the test; frequency distribution of chemicals (classes) according to their mutagenic activity; quantitative relationship between mutagenicity versus electrophilicity versus carcinogenicity of some selected carcinogens; chemicals that are activated into mutagens by human-liver enzymes; compounds that have been tested in the presence of rodent hepatic versus extra-hepatic tissue fractions; and some factors involved in the efficient detection of mutagens *in vitro*, i.e., the source and concentration of liver microsomal protein required for maximal mutagenic activity. As 34 chemicals have also been tested in microsome- or cell-mediated mutagenicity assays by using V79 Chinese hamster cells, an intercomparison is made of test results obtained in bacterial and mammalian assays. (Author abstract by permission)

80-2919. Vargova, M.; Polakova, H.; Podstavkova, S.; Siskova, A.; Dolan, L.; Vlcek, D.; Miadokova, E. (Res. Inst. Prev. Med., Bratislava, Czechoslovakia) **The mutagenic effect of the new insecticide and acaricide pyridathion.** *Mutat. Res.* 78(4): 353-360; 1980 (16 references).

The potential mutagenic effect of the new organophosphate insecticide and acaricide, pyridathion, was tested on *Escherichia coli*, strains WP2, WP2 uvrA, and on *Salmonella typhimurium*, strains TA100 and TA98, both with and without metabolic activation. The compound was tested at 1, 10 and 100 μg/ml. The analysis of chromosomal aberrations in mouse bone marrow was performed after a single po application of pyridathion at doses of 0.6, 1.11, 6.0, 12.0 and 24.0 mg/kg body wt, ip application at 6.0 mg/kg body wt, and repeated application (5 times) po at 1.0, 2.5 and 5.0 mg/kg body wt. Analysis of rat bone marrow was performed after a 3 mo po application of pyridathion at 0.07, 0.175 and 0.35 mg/kg body wt. An analysis of chromosomal aberrations in human peripheral lymphocytes *in vitro* was performed 24 hr after the application of pyridathion into the culture in concentrations of 9.2×10^{-3}, 9.2×10^{-4} and 9.2×10^{-5} moles. The insecticide did not exert any mutagenic effect on the bacteria. There was no significant increase in the frequency of chromosomal abnormalities in bone marrow of mice or rats, or in human peripheral lymphocytes *in vitro*, compared with controls. (Author abstract by permission)

80-2920. Vargova, M.; Polakova, H.; Podstavkova, S.; Siskova, A.; Dolan, L. (Res. Inst. Prev. Med., Bratislava, Czechoslovakia) **Evaluation of the mutagenic effect of the new fungicide trimorphamide.** *Mutat. Res.* 78(4): 361-367; 1980 (9 references).

The new Czechoslovakian fungicide trimorphamide was tested for its mutagenic activity. To evaluate the potential mutagenic effects on *Drosophila*, trimorphamide at 0.5, 1.0, 5.0 and 10.0% was administered into the cultivation medium, and the sex-linked recessive lethal mutation detection test and the chromosome non-disjunction test were used. After administration of trimorphamide to mice at 60, 150 and 300 mg/kg body wt po, and 30, 70 and 150 mg/kg body wt ip in single and repeated (5×) doses, a cytogenetic analysis of chromosomal aberrations in bone-marrow cells was performed. The cytogenetic analysis of human peripheral lymphocytes for chromosomal aberrations in vitro was performed 24 hr after trimorphamide had been applied into the culture in concentrations 19.1×10^{-3}, 19.1×10^{-4} and 19.1×10^{-5} *M*. Under our testing conditions the trimorphamide concentrations used did not show any mutagenic effect upon *Drosophila*, compared with the controls. Also, under the conditions of the cytogenetic analysis, no significant increase in the frequency of chromosomal abnormalities in mouse bone marrow or in human peripheral lymphocytes was observed compared with the group of controls. (Author abstract by permission)

80-2921. Vaidya, V. G.; Patankar, N. (Dep. Zool., Res. Inst., Maharashtra Assoc. Cultiv. Sci., Pune 411004, India) **Studies on the cytogenetic effects of oxydemeton methyl in the human leukocyte and mouse micronucleus test systems.** *Mutat. Res.* 78(4): 385-387; 1980 (8 references).

Cultures of lymphocytes from human peripheral blood were treated with an aqueous solution of oxydemeton methyl, at final concentrations ranging from 10^{-3} to 10^{-9} *M*. Cultures were harvested after incubation at 37°C for 50 hr. Aberrations in treated cells consisted mainly of chromatid and isochromatid breaks. One chromatid translocation and two dicentric chromosomes were noted. The percentage of cells affected ranged from 5 to 17. Thus oxydemeton methyl is able to induce damage in human leukocyte chromosomes *in vitro*. Young male Swiss mice were injected ip with oxydemeton methyl at levels of 1, 2 or 3 mg/kg. Mice were killed 6 hr after the second injection. The study demonstrated a mutagenic effect of oxydemeton methyl.

80-2922. Nath, G.; Dikshith, T. S. S. (Dep. Zool., Univ. Allahabad, Allahabad, India) **Endosulfan residues in rat**

tissues. *Natl. Acad. Sci. Lett.* 2(7): 278-279; 1980 (9 references).

Albino rats were fed 11.0 mg/kg/day of endosulfan in peanut oil for 30 days. Upon sacrifice, various tissues were analyzed for endosulfan residues by GLC with ^{3}H electron capture detection. In another experiment, blood serum and tissue homogenates were incubated with either 10 or 20 ppm/g of the insecticide, and the average percentage of recoverable α-endosulfan was determined. Residue levels of α-endosulfan were found to be 1.144 ppm/g in blood plasma, 5.680 ppm/g in adipose tissue, 4.681 ppm/g in liver, 4.350 ppm/g in testis, 6.465 ppm/g in kidney, and 3.641 ppm/g in brain. Average percent recoveries for the pesticide from *in vitro* samples of blood serum, fatty tissue, liver, testis, kidney, and brain were 102.7710, 93.5095, 102.4858, 114.8158, 1119.1002, and 111.4638, respectively. These findings show that α-endosulfan given orally was quickly absorbed through the alimentary tract and taken to the various organs where it accumulated.

80-2923. Yagi, T. (Sch. Hyg., Fac. Med., Kyoto Univ., Kyoto, Japan) **[Histochemical analysis of the livers of rats intoxicated by PCB or DDT.]** *Nippon Eiseigaku Zasshi (Jpn. J. Hyg.)* 35(2): 524-532; 1980 (22 references) (Japanese).

Histochemical studies were carried out on rats fed diets containing PCB or DDT in two series of experiments. In the first experiment, 3 groups of male Wistar rats were fed a commercial diet, the commercial diet containing 50 mg/100 g PCB, or 58.3 mg of DDT/100 g of the basal diet for 30 days. Results showed that liver weight was significantly larger in PCB- and DDT-treated rats than in controls. Enlarged hepatic cells containing fat granules were found; however, a difference in the size of the fat granules occurred between PCB- and DDT-treated rats. Rats given PCB displayed coarser and more minute fat granules than those of DDT-treated rats, the latter being more uniform in size. The minute fat granules in the liver of rats given PCB were not eluted by organic solvents. In the second experiment, 4 groups of male Wistar rats were fed the commercial diet, the commercial diet plus PCB (50 mg/100 g), a synthetic diet, or the synthetic diet plus PCB (50 mg/100 g) for 30 days. Livers of rats given the commercial diet and the commercial diet plus PCB contained pigment sediments. Yellowish white fat sediments due to the accumulation of lipids appeared in the livers of groups given the synthetic diet with or without PCB. From the results of histochemical examination, the brownish pigment was presumed to be of a ceroid nature.

80-2924. Sasaki, K.; Kurosawa, K.; Abe, E.; Asanuma, S.; Suzuki, A.; Matsushima, S. (Inst. Rural Med., Usuda, Nagano, Japan) **[Toxicity and persistence of an organophosphorus pesticide, chlorpyrifos.]** *Nippon Noson Igakkai Zasshi (Jpn. J. Rural Med.)* 29(1): 62; 1980 (Japanese).

The acute oral toxicity and persistence of chlorpyrifos in rats and monkeys were studied. Three groups of equal numbers of male and female Wistar rats were given 0, 2.5, or 5 mg/kg of chlorpyrifos every 10 days for a total of 10 doses, before being sacrificed 5, 10, 20, and 40 days after the last administration for determination of chlorpyrifos levels in their adipose tissues. To two monkeys, 5 and 10 mg/kg of chlorpyrifos were given every 10 days for a total of 15 doses. Monkeys were observed for 100 days after dosing and electroencephalogram and whole blood cholinesterase activity measurements were taken. Chlorpyrifos was detected in all rats after 5 and 10 days, and in the female rats up to 20 days after dosing. No changes were found on the electroencephalogram of the monkey given the 5 mg/kg doses; however, abnormal waves were observed on the monkey dosed with 10 mg/kg of chlorpyrifos from 1 hr to 1 day after administration. The appearance of the abnormal wave continued for 1 day after each chlorpyrifos administration; however, from about the 10th administration, the abnormal wave occurred spasmodically for 5 days. Whole blood cholinesterase activity was reduced slightly within 2 hr of chlorpyrifos administration, but showed a very gradual recovery. Whole blood cholinesterase levels did not approach original levels even by 240 days after the last administration.

80-2925. Hirooka, Y.; Kasai, A. (Inst. Rural Med. Usuda, Nagano, Japan) **[Studies on mutagenicity of pesticides for use in agriculture (Part 1).]** *Nippon Noson Igakkai Zasshi (Jpn. J. Rural Med.)* 29(1): 63; 1980 (Japanese).

The mutagenicity of 8 pesticides on 2 strains of *Bacillus subtilis* were examined. The H17 strain of *B. subtilis* is capable of repairing DNA damage, while the M45 strain is incapable of repairing DNA impairment. MO (CNP), thiometon, dicofol, DDT, trifluralin, paraquat dichloride, Amobam (used in the formation of zineb), dichlorvos, dicofol, and DDT were tested with the microbial strains to detect differences in sensitivity to DNA impairment. Only dichlorvos had a damaging effect to strains of *B. Subtilis.*

80-2926. Buei, K.; Niki, T.; Toyoda, M. (Lab. Med. Zool., Osaka Prefect. Inst. Public Health, Osaka 537, Japan) **[Effects of a juvenile hormone mimic, methoprene, against synanthropic flies.]** *Nippon Noyaku Gakkaishi (J. Pestic. Sci.)* 4(4): 481-486; 1979 (21 references) (Japanese).

The effects of methoprene on embryonic, larval and adult stages of 8 species of synanthropic flies were examined in laboratory experiments. When eggs of *Musca domestica* were immersed into a 5% emulsified solution of methoprene, a 95% reduction in fly hatchability occurred. Greater reductions in adult emergence took place when the

juvenile hormone analogue was applied to fully grown larvae than when it was applied to younger larvae. When 49 μg of methoprene were applied to 2-day-old females of the flesh fly *Boettcherisca peregrina*, their larval production was reduced by 50%. A decrease in fecundity was found when fully grown larvae of the flesh fly were treated with the juvenile hormone analogue. When larvae were exposed to 0.06 μg of methoprene, fecundity was reduced from 49 to 0-17 larvae per female.

80-2927. Miyauchi, M.; Takagi, M.; Uematsu, T. (Lab. Food Hyg., Fac. Fish., Hokkaido Univ., Hakodate 041, Japan) **Studies on toxicities of biphenyl ether herbicides and their analogues to fish. I. The methemoglobin-formation by the nitroso-derivatives in white-spotted char, *Salvelinus leucomaenis*, erythrocytes.** *Nippon Suisan Gakkaishi (Bull. Jpn. Soc. Sci. Fish.)* 45(12): 1563-1567; 1979 (19 references).

2,4-Dichloro *p*-nitrobiphenyl ether and 2,4,6-trichloro *p*-nitrobiphenyl ether and their analogues were added to suspensions of white spotted char or human erythrocytes at levels of 2 mg/ml to investigate methemoglobin formation by these biphenyl ether herbicide nitroso-derivatives. All of the compounds tested induced methemoglobin formation in erythrocytes of both species with the same order or potency, which was: nitrosobenzene > *p*-nitrosobiphenyl ether > 4-chloro *p*-nitrosobiphenyl ether. Potency of methemoglobin stimulating ability was dependent on the number of chlorines rather than the position of substitution in the phenoxy group. Methemoglobin formation by the nitroso-derivatives took place by similar mechanisms in erythrocytes of both species and required NADPH-dependent enzyme systems. Methemoglobin reduction was also similar in erythrocytes of humans and white spotted char and depended upon reception of enzymatic reactions which were NADH-dependent.

80-2928. Miyauchi, M.; Takagi, M.; Uematsu, T. (Lab. Food Hyg., Fac. Fish., Hokkaido Univ., Hakodate 041, Japan) **Studies on toxicities of biphenyl ether herbicides and their analogues to fish. II. Production of methemoglobin- forming metabolites of the amino-derivatives by white-spotted char, *Salvelinus leucomaenis*, liver homogenate.** *Nippon Suisan Gakkaishi (Bull. Jpn. Soc. Sci. Fish.)* 45(12): 1569-1574; 1979 (21 references).

Liver homogenates from white-spotted char and rats were tested for their ability to metabolize amino-derivatives of biphenyl ether herbicides and their analogues to methemoglobin- forming metabolites. Liver homogenates were incubated with the amino-derivatives, a NADPH-generating system and erythrocytes for white spotted char, rats or humans. *p*-Aminobiphenyl ether was metabolized to a small extent by white-spotted char liver homogenates. All of the amino-derivatives tested were metabolized to methemoglobin- forming products by the rat liver homogenates with rates of methemoglobin formation in the order of: *p*-aminobiphenyl ether > 4-chloro *p*-aminobiphenyl ether > 2,4-dichloro *p*-aminobiphenyl ether > 2,4,6-trichloro *p*-aminobiphenyl ether. Human erythrocytes were found to be the most sensitive to the methemoglobin-forming metabolites, followed by erythrocytes of rat, and then those of white spotted char.

80-2929. Sawicki, R. M.; Devonshire, A. L.; Payne, R. W.; Petzing, S. M. (Dep. Insec. & Fungic., Rothamsted Exp. Stn., Harpenden, Herts AL5 2JQ, England) **Stability of insecticide resistance in the peach-potato aphid, *Myzus persicae* (Sulzer).** *Pestic. Sci.* 11(1): 33-42; 1980 (18 references).

Anholocyclic *Myzus persicae* (Sulz.) from the glasshouse and field can be classified into six variants, each with a characteristic carboxylesterase activity and consequent resistance to carbamate and organophosphorus insecticides. Overlapping activity distributions prevent unequivocal identification of an individual from measurements of its enzyme activity, but this may be done by cloning and measuring the frequency distribution of the enzyme activity in its progeny. Although each of the four lowest esterase variants has a frequency distribution with a single peak, only the susceptible (US1L) is best described by a single normal distribution. Those of the other three clones (MSIG, French R and TIV) correspond better with two Normally-distributed components. However, these are not well separated and the lower component accounts for only 10-25% of the individuals. The very resistant clones from glasshouses have higher mean activities but with very broad distributions covering the whole range observed in this aphid. These broad distributions have peaks corresponding to those of the less resistant variants and arise from the appearance at each generation of a small proportion of individuals with much less active enzyme than their parents. Careful monitoring of the changes in activity between parents and offspring of the most resistant variant (clone G6) showed that complete loss of resistance can occur either in a single step or over several generations, and that below a threshold value, reversion to higher levels is very rare. Such reversion could not be detected by selection, with insecticide, of large clonal populations from an individual that had lost activity. High esterase activity was not stabilized by breeding for 16 generations only from individuals with high esterase activity, and is probably maintained in glasshouses by continuous exposure to insecticides. Spontaneous loss of esterase activity and resistance was observed only in glasshouse populations. (Author abstract by permission)

80-2930. Mukku, V. R.; Robison, A. K.; Stancel, G. M. (Dep. Pharmacol., Med. Sch., Univ. Texas, Houston, TX 77025) **The antiestrogenic activity of *o,p'*-DDT.** *Pharmacologist* 22(3): 159; 1980.

While *o,p'*-DDT in a single dose has been shown to increase uterine weight of immature rats in a manner similar to that of 17 β-estradiol (E_2), it does not produce antiestrogenic activity. After daily injections for 3 days, *o,p'*-DDT causes increases in uterine weight and protein content equaling only 50% of those produced by E_2. These effects resemble those produced by the antiestrogenic triphenylethylene compounds. Antiestrogenic activity was exhibited when *o,p'*-DDT was given in a 3 day assay; the uterine response was 50% of the E_2 response. Uterine response to E_2 + DDT was midway between that of the hormone or the pesticide alone. Since *p,p'*-DDT induces mixed function oxidases (MFO) to a greater extent than the *o,p'*-isomer, but has less affinity for the uterine E_2 receptor, the observed antiestrogenic activity was not attributed to hepatic MFO induction nor to a decrease in the uterine content of cytoplasmic estrogen receptor.

80-2931. Rieger, J. A.; Robinson, C. P.; Gherezghiher, T.; Leung, T. (Univ. Oklahoma Coll. Pharm., Oklahoma City, OK 73190) **Inhibition of mammalian monoamine oxidase by two formamidine pesticides.** *Pharmacologist* 22(3): 172; 1980.

The inhibition of tyramine and tryptamine metabolism by amitraz and chlordimeform was examined *in vitro* in homogenates of rat liver, brain and lung. The average percent inhibition produced by 160 nmol of chlordimeform in the presence of 400 nmol of substrate was 40.0 for liver, 31.3 for brain, and 34.0 for lung in the case of tyramine, and 37.3 for liver, 30.0 for brain and 40.0 for lung in the case of tryptamine. The average percent inhibition produced by 0.3 m*M* amitraz in the presence of 0.3 m*M* substrate was 27.5 for liver, 38.1 for brain, and 28.8 for lung in the case of tyramine, and 33.7 for liver, 22.2 for brain, and 24.8 for lung in the case of tryptamine. These findings show the weak monoamine oxidase inhibiting ability of amitraz and the weak substrate or tissue selectivity of chlordimeform.

80-2932. Kim, S. J.; Roberts, J. F.; Koo, J. O. (North Carolina State Univ., Raleigh, NC 27650) **Effect of paraquat on erythrocytic 2,3-diphosphoglycerate in hamsters.** *Pharmacologist* 22(3): 172; 1980.

Syrian golden hamsters *(Mesocricetus auratus)* were treated ip with 30 mg/kg paraquat in a single dose. Levels of erythrocytic 2,3-diphosphoglycerate (DPG) were determined at 12, 24, 36 and 48 hr after pesticide administration. DPG values were significantly elevated in the paraquat-treated hamsters at 12 hr and subsequently decreased until control levels were reached at about 48 hr. Inorganic phosphorus levels were increased in the paraquat-treated hamsters at 24, 36 and 48 hr. In the hamsters given paraquat, the DPG/hemoglobin ratio was also elevated at 12, hr and then slowly returned to normal. Despite the elevated pool of inorganic phosphorus for the remainder of the experiment, the metabolic processes of the DPG system were unaltered. The observed changes in DPG levels immediately after insult by paraquat may play a part in the early development of hypoxia.

80-2933. Kawakubo, K.; Shindo, M.; Konotsune, T. (Agric. Chem. Res. Lab., Sankyo Co. Ltd., Yasu, Shiga, Japan) **Mechanism of chlorosis caused by 1,3-dimethyl-4-(2, 4-dichlorobenzoyl) -5-hydroxypyrazole, a herbicidal compound.** *Plant Physiol.* 64(5): 774-779; 1979 (24 references).

Various plant materials were used in studies carried out to elucidate the mechanism of action of the herbicide 1,3-dimethyl-4-(2, 4-dichlorobenzoyl) -5-hydroxypyrazole (DTP). Chlorophyll *a* and *b* extracted from rice seedlings were converted by DTP into pheophytin *a* and *b*. The 5-hydroxypyrazoles, which were dissociable, were essential for the induction of chlorosis. In tests on barnyard grass seedlings, the chlorosis induced by DTP was reversed by cultivating the seedlings in media containing DTP plus NaOH, KOH, NH_4OH, $Ca(OH)_2$, sodium acetate, sodium pyruvate, sodium succinate, or sodium fumarate. It was suggested that DTP blocks the synthesis of protochlorophyllide in intact plants and consequently induces chlorosis.

80-2934. Malmquist, E. (Dep. Clin. Chem. & Pediat. Pathol., Karolinska Sjukhuset, S-10401 Stockholm, Sweden) **The influence of paraquat on the *in vivo* incorporation of lecithin precursors in lung tissue and alveolar lecithin.** *Scand. J. Clin. Lab. Invest.* 40(3): 233-237; 1980 (7 references).

Female Sprague Dawley rats were injected sc with aqueous paraquat at 35 mg/kg. Rats were sacrificed at 14 or 48 hr after dosing. At the time of sacrifice, all but one of the paraquat-injected rats showed signs of intoxication composed of grunting and impaired respiration with tachnypnoea. All showed significantly reduced levels of lecithin. Respiratory symptoms were more pronounced in the animals intoxicated for 48 hr, but the maximal reduction of lecithin in the lavage fluid had been achieved within 14 hr. When palmitic acid and choline were incorporated into both lung tissue lecithin and alveolar lecithin, paraquat did not interfere with their incorporation into lung tissue lecithin or alveolar lecithin. Incorporation of choline into alveolar lecithin was more than twice that in lung tissue lecithin. Choline incorporation in alveolar lecithin was highly reduced in animals poisoned with paraquat. Fatty acid composition of lung tissue lecithin and alveolar lecithin was equal in controls and experimental animals.

80-2935. Lohs, K. (Author address not given) **Toxikologische Probleme bei der Holzverwertung.**

[Toxicologic problems in wood utilization.] *Sitzungsber. Akad. Wiss. DDR* 17N: 66-68; 1979 (3 references) (German).

Toxicologic problems in wood utilization may arise from natural toxins of tropical woods, wood finishing treatments, and pesticide contamination of wood. The burning of wood preserved with pentachlorophenol based preparations results in formation of dioxin by pyrolysis. Instances of serious illness have followed the burning of wood preserved with chlorophenols or grown on land treated with 2,4,5-T and its derivatives. In addition to the dioxin introduced to the environment in Vietnam by the application of contaminated 2,4,5-T, dioxin was produced when herbicide-treated acreages were flamed with napalm. Chlorinated dioxins may also form during the incineration of black liquors from pulp manufacture when lignin has been removed from the pulp by chlorine bleaching. Recent studies have indicated that wood dust itself can cause nasopharyngeal cancers.

80-2936. Sawicki, R. M. (Rothamsted Exp. Stn., Rothamsted, England) **Resistance to pesticides. 1. Resistance of insects to insecticides.** *Span Progr. Agric.* 22(2): 50-52; 1979.

The genetic factors involved in the selection for, and development of, resistance are outlined. The mechanisms of resistance have been categorized as: delayed entry of the toxicant; metabolic detoxication or decreased activation; and decreased sensitivity at the activation site. Increased metabolic detoxication is the most common mechanism; enhanced monooxygenase, transferase and hydrolase enzymes and insensitive acetylcholinesterase have given rise to many organophosphate resistant insect strains. Altered enzymes or altered amounts of detoxifying enzymes have also allowed development of cross-resistance. Multiple and multiplicate resistance is found in insects with two or more mechanisms for protection against insecticides. Sequential resistance develops when insects acquire cross-resistance to several types of insecticides and become highly resistant to alternative control measures. Suggestions for avoiding development of insect resistance to new chemicals are given.

80-2937. Conway, G. R.; Comins, H. N. (Environ. Manage. Unit, Coll, London, England) **Resistance to pesticides. 2. Lessons in strategy from mathematical models.** *Span Progr. Agric.* 22(2): 53-54; 1979 (6 references).

Mathematical models are used to predict the possible development of insecticide resistance by using the variables of genetic interactions, frequency, dominance and selection pressure. Modelling allows derivation of relative time scales of the development of resistance to different control options. The model described assumes a large homogeneous pest population is present which has a single gene for resistance that operates equally in both sexes. Survival rates of individuals homozygous for no resistant gene, heterozygous individuals, and individuals homozygous for the resistant gene, and the initial gene frequency are used to predict the time between the initial use of the pesticide and the observation of resistance. The model indicates that the gene will be at a low frequency when no pesticides are used, will spread rapidly when pesticide use is begun, and will finally reach such a high frequency that use of the pesticide will be discontinued. Use of the model to determine effective application rates and for generating an economic model are also discussed.

80-2938. Panda, B. B.; Sharma, C. B. S. R. (Cytogen. Lab., Dep. Bot., Berhampur Univ., Berhampur, India) **Organophosphate induced chlorophyll mutations in *Hordeum vulgare*.** *Theor. Appl. Genet.* 55(6): 253-255; 1979 (16 references).

Barley seeds *(Hordeum vulgare)* were used to test the mutagenic potential of ten organophosphorus insecticides. The seeds were soaked in distilled water for 15 hr, then treated for 6 hr in 1500 ppm insecticide solutions which were prepared in phosphate buffer at pH 7. A solution of ethyl methanesulfonate served as a positive control, and negative control consisted of seeds treated in buffer only. After treatment, the seeds were sown in greenhouses and were allowed to germinate and grow to maturity. The seedlings were screened for morphological and chlorophyll mutants. All the insecticides tested produced coleoptile elongation without leaf emergence, which is considered lethal. This defect was attributed to altered gene activities affecting enzyme production and function, and was considered a mutation. Eight of the organophosphate insecticides tested, phosphamidon, monocrotophos, dichlorvos, trichlorfon, thiodemeton (disulfoton), oxydemeton methyl, fenitrothion, and methyl parathion induced chlorophyll mutations. Fenthion and fensulfothion did not.

80-2939. Ogata, A.; Yoshida, S.; Nawai, S.; Ando, H.; Kubo, K.; Hiraga, K.; Masubuchi, M. (Dep. Toxicol., Tokyo Metrop. Res. Lab. Public Health, Tokyo, Japan) **[Dominant lethal tests of long term administration with sodium *ortho*-phenylphenolate (Na-OPP) in mice.]** *Tokyo Toritsu Eisei Kenkyusho Kenkyu Nempo (Annu. Rep. Tokyo Metrop. Res. Lab. Public Health)* 29(2): 99-103; 1978 (11 references) (Japanese).

The dominant lethality of sodium *o*-phenylphenol (Na-OPP, sodium phenylphenate) to mice was examined. Various diets containing Na-OPP were given to male mice for 2 mo and food intake, body weight, and mortality were recorded. Male mice treated with Na-OPP were mated with non-treated, nulliparous females and each female mouse was subjected to laparotomy on day 12 or 13 of pregnancy

to examine the fetus and number of corpora lutea. During the feeding experiments, 6% of the group fed 4% Na-OPP, and 1.66% of the control group died. Significant suppression of weight gain and food intake were observed in mice fed 4% Na-OPP. Reduced matings were observed among the male rats given Na-OPP. Significant reductions were recorded in the number of corpus luteum in females mated with males treated with 4%, 2%, and 1% Na-OPP. Significant reductions in the number of live fetuses produced by these groups were also noted; however, the number of dead fetuses was significantly increased only in females mated with males given 2% Na-OPP. No significant increase in the number of early fetal deaths, which is the important value in the evaluation of dominant lethality were observed. Although the rate of inducing the dominant lethality was obtained by following the method of Rohrborn, the results showed only a 3.8 index for females mated with males given 2% Na-OPP. Considering that the mean intake of Na-OPP was far larger than the LD50 value requirements (1000 mg/kg/male mouse), and the above-mentioned rate of inducing dominant lethality was 63.9 in the positive controls (mated with the males administered 200 mg/kg of ethyl methane sulfonate), it was concluded that Na-OPP administered to male mice did not induce the dominant lethal effect in female mice upon mating.

80-2940. Sasaki, M.; Fukui, S.; Nakao, T. (Dep. Toxicol., Tokyo Metrop. Res. Lab. Public Health, Tokyo, Japan) **[Cytotoxicity of *ortho*-phenylphenol: assay of the toxicity by using radioactive Cr-labeled cells.]** *Tokyo Toritsu Eisei Kenkyusho Kenkyu Nempo (Annu. Rep. Tokyo Metrop. Res. Lab. Pub. Health)* 29(2): 104-108; 1978 (5 references) (Japanese).

The cytotoxicity of sodium *o*-phenylphenol (sodium phenylphenate, Na-OPP) was examined on spleen cells and erythrocytes taken from female C3H/HeN mice and on the cultured strain cells derived from the ovary of Chinese hamster, CHO-KI cells. These cells were labeled by radioactive sodium chromate and incubated with various concentrations of Na-OPP, and then radioactivity of released ^{51}Cr from the destroyed cells was counted after incubation periods. By adding 200 μg/ml of Na-OPP, all of these cells were completely destroyed. Only partial destruction of cells by 100 and 50 μg/ml was found with a dose-response relationship existing in the range tested. Lower doses of Na-OPP, (20, 10, and 5 μg/ml) showed no cytotoxicity to the spleen cells *in vitro*. This effect was considered to be nonspecific. Spleen cells were destroyed by the addition of Na-OPP after a very short incubation period, and a greater number of erythrocytes were destroyed after long term culture with Na-OPP. CHO-KI cells were slightly less sensitive than the other cells to treatment with Na-OPP. The above-mentioned results suggest that the cytotoxic effects of Na-OPP are related to the stability of the cells *in vitro* and/or the ability of cells to divide.

80-2941. Sasaki, M.; Nakao, T. (Dep. Toxicol., Tokyo Metrop. Res. Lab. Public Health, Tokyo, Japan) **[Effect of *ortho*-phenylphenol on the immune response *in vitro*.]** *Tokyo Toritsu Eisei Kenkyusho Kenkyu Nempo (Annu. Rep. Tokyo Metrop. Res. Lab. Public Health)* 29(2): 109-111; 1978 (4 references) (Japanese).

The effect of sodium *o*-phenylphenol (Na-OPP, sodium phenylphenate) on the primary immune response was examined *in vitro*. By the addition of 3 and 0.3 mg/ml of Na-OPP, the number of plaque forming cells in cultured spleen cells from normal C3H/HeN mice when incubated with sheep erythrocytes was reduced. The addition of 0.03 mg/ml of Na-OPP had little influence on the formation of antibody *in vitro*. This suppressive effect of Na-OPP presumably had a LD50 of 30 to 300 μg/ml/10^7 cells to the antibody forming cells, and might be caused by Na-OPP's nonspecific cytotoxicity.

80-2942. Ogata, A.; Ando, H.; Kubo, Y.; Hiraga, K. (Dep. Toxicol., Tokyo Metrop. Res. Lab. Public Health, Tokyo, Japan) **[Teratological tests of thiabendazole in mice.]** *Tokyo Toritsu Eisei Kenkyusho Kenkyu Nempo (Annu. Rep. Tokyo Metrop. Res. Lab. Public Health)* 29(2): 112-115; 1978 (3 references) (Japanese).

The teratological action of thiabendazole was examined in female JCL-ICR mice given oral doses of the fungicide during the 7th to 15th day of pregnancy at 2400, 1300, or 700 mg/kg. Body weight gain was suppressed in a dose-dependent manner, and 62.5% of the 2400 mg/kg group died of hemorrhage from the vagina presumably due to abortions. Macroscopic observations upon autopsy revealed necrosis of the kidneys in most of the mice of the 2400 and 1300 mg/kg dose groups and in some from the 700 mg/kg group. No significant variations were found in mean numbers of corpus luteum and embeddings, nor in sexual ratios of fetuses. Reduced fetal weights and frequency of occurrence of dead fetuses increased with increasing thiabendazole dosage. The frequency of occurrence of palatoschisis was also greater with higher doses of the fungicide. Upon skeletal examinations of the fetuses, adhesion of the rib and thoracic vertebrae were observed in the 1300 and 700 mg/kg dose groups. No skeletal anomalies were found in the fetuses of the 2400 mg/kg dose group that had displayed palatoschisis. The occurrence of incomplete formation of the skull, and reduction in size of the sternal skeleton and its partition seemed to be dose-dependent. The degree of ossification was clearly delayed with the increased doses of the fungicide.

80-2943. Andrews, A. W.; Fornwald, J. A.; Lijinsky, W. (Carcinog. Program, NCI Frederick Cancer Res. Cent., Frederick, MD 21701) **Nitrosation and mutagenicity of some amine drugs.** *Toxicol. Appl. Pharmacol.* 52(2): 237-244; 1980 (27 references).

Several drugs and related compounds which are secondary and tertiary amines were tested for mutagenicity with the Ames *Salmonella*/mammalian-microsome mutagenicity test, as were the products of their nitrosation. Of the 17 compounds tested, 3 were mutagenic (lucanthone, quinacrine, and thiram). After treatment with nitrite in acetic acid, 12 of the compounds yielded mutagenic nitrosation products (chlordiazepoxide, chlorpromazine, cyclizine, dextroproquinacrine, thiram, and tolazamide). Aminopyrine, chlorpheniramine, disulfiram, methadone, and tolbutamide were not mutagenic under any test conditions. (Author abstract by permission)

80-2944. Baggett, J. M.; Thureson-Klein, A.; Klein, R. L. (Dep. Pharmacol. & Toxicol., Med. Cent., Univ. Mississippi, Jackson, MS 39216) **Effects of chlordecone on the adrenal medulla of the rat.** *Toxicol. Appl. Pharmacol.* 52(2): 313-322; 1980 (38 references).

Rats were treated with the chlorocarbon analogs chlordecone or mirex (200 ppm) for 8 days and the adrenal glands removed for catecholamine analysis and ultrastructural examination. Total catecholamine content was reduced 54% from 22.07 ± 2.8 (SE) to 10.26 ± 1.2 μg per gland after chlordecone but was not significantly changed after mirex. There was a selective decrease in epinephrine of 63% and an increase in norepinephrine of 28% after chlordecone but not after mirex. Phenylethanolamine-*N*-methyl transferase, the enzyme that converts norepinephrine to epinephrine, was not inhibited by chlordecone *in vitro*. The biochemical data were supported by electron microscopy after the use of two different fixation methods. Perfusion of the adrenal glands in control rats with glutaraldehyde-formaldehyde, postosmification and block-staining gave good general preservation with well-defined epinephrine and norepinephrine cells. Block-fixation in glutaraldehyde-dichromate also resulted in easily identified epinephrine and norepinephrine cells. After chlordecone, the catecholamine-containing granules of the epinephrine cells, but not of the norepinephrine cells, became depleted as visualized by both methods. Mirex had no morphological effect on epinephrine or norepinephrine granules. Thus, distinct differences between the two closely related structural analogs chlordecone and mirex were demonstrated on the catecholamine contents and epinephrine cell ultrastructure in the rat adrenal medulla. These differences are speculated to result from differential effects on mitochondrial and/or granular Mg^{2+}-ATPase and on adrenal corticosteroid levels. (Author abstract by permission)

80-2945. Kornbrust, D. J.; Mavis, R. D. (Dep. Radiat. Biol. & Biophys., Sch. Med. & Dent., Univ. Rochester, Rochester, NY 14642) **The effect of paraquat on microsomal lipid peroxidation *in vitro* and *in vivo*.** *Toxicol. Appl. Pharmacol.* 53(2): 323-332; 1980 (30 references).

Rat lung and liver microsomes did not undergo lipid peroxidation in the absence of iron when incubated with NADPH and concentrations of paraquat ranging from 10^{-7} to 10^{-2} *M*. Paraquat also did not stimulate rat liver and lung microsomal peroxidation induced by added iron and NADPH, and was inhibitory at concentrations above 10 μ*M*. Similarly, no stimulation of peroxidation was produced by paraquat in rabbit or human lung microsomes; however, under similar conditions, paraquat enhanced NADPH/iron-dependent peroxidation in mouse lung and liver microsomes, apparently by facilitating reduction of iron by the mouse microsomes. In lung microsomes obtained from rats sacrificed at 12, 18, and 24 hr following a lethal dose of paraquat (50 mg/kg, ip), there was no loss of vitamin E or increase in susceptibility to *in vitro* peroxidation which would be expected if lipid peroxidation had occurred *in vivo*, although extensive lung damage developed during this time period. In addition, no decrease in peroxidizable polyunsatured fatty acids was observed in lung homogenate or microsomes obtained from the paraquat-treated rats, although there was a significant reduction in the palmitate content of these fractions at 24 hr post injection. These results indicate that paraquat does not cause pulmonary toxicity by initiating peroxidation of lung lipids, and the decrease of palmitate in paraquat-damaged lungs is consistent with inhibition of fatty acid synthesis as an early event in the pathogenesis of paraquat toxicity. (Author abstract by permission)

80-2946. Davies, D. B.; Holub, B. J. (Dep. Nutr., Coll. Biol. Sci., Univ. Guelph, Guelph, Ontario N1G 2W1, Canada) **Comparative subacute toxicity of dietary diazinon in the male and female rat.** *Toxicol. Appl. Pharmacol.* 54(3): 359-367; 1980 (33 references).

Male and female rats were fed a semipurified diet containing either 0, 2, or 25 ppm diazinon for varying times. At appropriate times, animals were bled from the orbital sinus to facilitate measurement of plasma cholinesterase and erythrocyte acetylcholinesterase activities. Additional animals were sacrificed to enable determination of brain acetylcholinesterase activity. General nutritional evaluations included measurement of body weight gains and feed consumption during the growing period. Feeding diazinon at the levels employed produced no visible toxic manifestations. Body weight gains and feed consumption were comparable among control and treated groups during all studies. Feeding 25 ppm diazinon for 30 days produced more significant reduction of cholinesterase activity in plasma (by 22-30%) and brain (by 5-9%) among treated females compared to corresponding males. Erythrocyte acetylcholinesterase activity was significantly more depressed (by 13-17%) in treated females relative to appropriate males at days 21-28 of the feeding trial. At no time was cholinesterase activity in any tissue assayed more significantly reduced among treated males than females.

Feeding 2 ppm diazinon for 7 days failed to modify erythrocyte acetylcholinesterase activity among both sexes relative to controls. Plasma cholinesterase activities of treated males were not significantly different from control values, whereas, treated females showed significant depression (by 29%) of plasma enzyme activity. This latter finding is of interest since 2 ppm is the no effect level of diazinon for the rat established by the FAO/WHO on the basis of studies which focused on the male sex. The results indicate the female rat to be more sensitive to the toxicity of dietary diazinon compared to the male. (Author abstract by permission)

80-2947. Gasiewicz, T. A.; Holscher, M. A.; Neal, R. A. (Cent. Toxicol., Dep. Biochem. Vanderbilt Univ. Sch. Med., Nashville, TN 37232) **The effect of total parenteral nutrition on the toxicity of 2,3,7,8-tetrachlorodibenzo-*p*-dioxin in the rat.** *Toxicol. Appl. Pharmacol.* 54(3): 469-488; 1980 (42 references).

The effects of total parenteral nutrition (TPN) upon the toxicity of 2,3,7,8-tetrachlorodibenzo- *p*-dioxin (TCDD) in rats has been studied. At doses of 50 or 100 μg/kg, TPN-fed, TCDD-treated rats demonstrated a weight gain similar to that of TPN-fed controls, but died at days 13-17 following treatment. Gross examination of moribund animals revealed icterus, thymic atrophy, increased adipose tissue depots, and enlarged livers. The liver weights ranged from two to three times those from TPN-fed control animals. Histologically the livers were severely necrotic. Most cells which were not necrotic were markedly swollen and disorganized. Extensive vacuolization of hepatocytes and cystic areas containing cell debris were also prominent features. Whereas glycogen stores were depleted, the total content of water, lipid, protein, RNA, and DNA in the livers was increased. Alterations in cytochrome P450 associated monooxygenase activities were also observed. Statistically significant increases in serum iron, bilirubin, alkaline phosphatase, serum glutamic-oxaloacetic transaminase and cholesterol were found in the TPN-fed, TCDD-treated animals. Serum protein, glucose, and triglycerides were significantly decreased except in a few severely moribund animals in which hyperglycemia was observed. The results in the TPN-fed, TCDD-treated rats were compared with TCDD-treated rats fed a chow diet *ad libitum*. At the same dose of TCDD, the liver damage in the TPN-fed, TCDD-treated rats was histologically more severe. (Author abstract by permission)

80-2948. Nomiyama, K.; Matsui, K.; Nomiyama, H. (Dep. Environ. Health, Jichi Med. Sch., Tochigi-ken 329-04, Japan) **Environmental temperature, a factor modifying the acute toxicity of organic solvents, heavy metals, and agricultural chemicals.** *Toxicol. Lett.* 6(2): 67-70; 1980 (11 references).

Male ICR-JCL mice acclimatized to temperatures of 8, 22, or 38°C were given ip doses of benzene, toluene, trichloroethylene (TCE) or copper sulfate or ip doses of chromium trioxide, or sc doses of mercuric chloride, and both sc and ip doses of Fratol (sodium fluoroacetate), methyl parathion or dieldrin. LD50 values reflected an increase in the acute toxicity of benzene, TCE, mercuric chloride, cadmium chloride, Fratol, methyl parathion, and dieldrin at 8° and 38°C. Increases in acute toxicity of toluene, copper sulfate and chromium trioxide were found only at the high temperature of 38°C. These findings indicate aggravation of the effects of environmental pollutants by changes in temperature. The effects of temperature on intestinal absorption of pollutants and the role of route of exposure in the toxicity of these compounds are areas suggested for further attention.

80-2949. Filho, E. S.; Dhingra, O. D. (Phytopathol. Div., Univ. Federal Vicosa, Vicosa MG, Brazil) **Effect of herbicides on survival of *Macrophomina phaseolina* in soil.** *Tr. Br. Mycol. Soc.* 74(1): 61-64; 1980 (24 references).

EPTC (0.02 ml AI/100 g), dinoseb (0.07 ml AI/100 g), alachlor (0.08 ml AI/100 g), fluorodifen (0.03 ml AI/100 g), and fluometuron (0.03 ml AI/100 g) were applied to two field soils infected with 500 mg of dry sclerotia of *Macrophomina phaseolina*, a fungal plant pathogen. Dinoseb caused declines in the *M. phaseolina* population of 96% in sandy-clay-loam and 61% in sandy loam after 10 days. In fluorodifen treated sandy-loam soil, fungal population decreased by 85% while in sandy-clay-loam soil, it dropped 50% over fifty days. *M. phaseolina* populations of both soils were reduced by 46-63% over the entire test period after treatment with EPTC, fluometuron or alachlor. These results indicate that soil type plays a role in the toxicity of herbicides to soil microorganisms. The effects of herbicides on populations of soil fungi are also important to consider when the phytotoxicity of a fungal plant pathogen is directly related to its inoculum density in the soil.

80-2950. Reuber, M. D. (Exp. Pathol. Lab., Frederick Cancer Res. Cent., Frederick MD 21701) **Histopathology of carcinomas of the liver in mice fed perthane.** *Tumori* 66(3): 277-283; 1980 (14 references).

Hybrid male and female B6C3F1 mice were fed perthane at 2 dose levels in their food for 2 yr. Females received either 2,828 ppm or 6,200 ppm perthane for 95 wk. Males received either 2,500 or 5,000 ppm for 100 wk. Mice were sacrificed at 105 wk. An extremely significant increase in the incidence of hepatocellular carcinomas of the liver was noted among the treated female mice. Male mice demonstrated a slight increase in hepatocellular carcinomas. Most of these carcinomas were poorly differentiated or undifferentiated. Cholangiocarcinomas, car-

cinosarcomas and neoplasms were also noted in treated, but not in control, mice.

80-2951. Sherman, R. A. (Environ. Hyg. Ag., US Army, Aberdeen Proving Ground, MD) **Behavioral effects of acute aerosol exposure to *N,N*-diethyl-*meta*-toluamide (M-Det), January-February 1979.** *US NTIS AD Rep.* AD-A076,939/8: 28 pp.; 1979.

Groups of 10 male and 10 female rats were exposed for single 4 hr periods to aerosols of M-Det (deet; an insect repellent) at concentrations estimated to be: high enough to produce minimal toxic signs (4100 mg/m³); too low to produce toxic signs (2900 mg/m³); or somewhat lower (2300 mg/m³). Concommitant controls were exposed to chamber air only. The rats were given a battery of behavioral tests as soon as the exposure period ended. The results of the battery permitted distinctions to made between performance at all three levels and controls for both males and females. Tests included measures of activity, endurance, balance, tactical sensitivity, post exposure learning, and memory of a task learned the day before exposure. Necropsy did not show any gross physical changes as a result of the exposure. Thus, behavioral tests were able to establish changes resulting from acute exposure to M-Det at concentrations below those at which toxic signs could be detected. (Author abstract by permission)

80-2952. Sherman, R. A. (Environ. Hyg. Ag., US Army, Aberdeen Proving Ground, MD) **Behavioral effects of subchronic aerosol exposure to *N,N*-diethyl-meta-toluamide (M-Det), February-May, 1979. Phase 3.** *US NTIS AD Rep.* AD-A077,163/4: 25 pp.; 1979.

Groups of 10 male and 10 female rats were exposed to aerosols of M-Det (deet) for 6 hr/day, 5 days/wk, for 13 wk at concentrations of 1,5000 mg/m³ (0.25 LC50), 750 mg/m³ (0.125 LC50), 250 mg/m³ (0.042 LC50), or chamber air. The rats were given balance, tactile sensitivity and endurance tests during wk 2, 4, 6, 8, 11 and 13 of the study. During wk 13, they were also given memory, learning and activity tests. The results of the battery permitted distinctions to be made among performances at all three levels and controls for both males and females. Results of most tests repeated throughout the study changed in various ways as the study progressed. No toxic signs were observed in the participants when behavioral tests were carried out, and none died during the study. No gross abnormalities were evident upon necropsy at the end of the study, and groups of the same sex remained statistically similar in wt. Results of hematologic, histopathologic, chemical, and physiological tests will be reported separately. No changes in use of M-Det are recommended until further tests are run by other laboratories testing lower concentrations. (Author abstract by permission)

80-2953. Bell, M. A.; Ewing, R. A.; Lutz, G. A.; Alley, E. G. (Battelle Columbus Lab., Columbus, OH) **Reviews of the environmental effects of pollutants. I. Mirex and kepone.** *US NTIS PB Rep.* PB-125,958: 254 pp.; 1978 (329 references).

The objective of this research program was to assemble and analyze the publicly available information on the environmental effects of the two organochlorine pesticides, mirex ($C_{10}Cl_{12}$) and its ketone analog, Kepone (chlordecone; $C_{10}Cl_{12}$). The data base on these compounds is limited, especially with respect to Kepone, on which almost no environmental research was conducted prior to the Life Sciences's Products Company incident. Both of these compounds are non-volatile, have very low water solubilities, are chemically and thermally very stable, and are quite resistant to biodegradation, thus, existing environmental residues can be expected to persist for years. Neither mirex nor Kepone appreciably affects microorganisms or plants in usual environmental concentrations. Mirex does not appear to present a serious acute toxicity problems to non-target terrestrial invertebrates as a result of fire ant control efforts. Both mirex and Kepone produce adverse reproductive effects in numerous species. Mirex has been shown to induce liver tumors in mice and rats and is judged to have potential carcinogenicity, and carcinogenic properties of Kepone have been documented in mice and rats. (Author abstract by permission)

80-2954. Robinson, C. P. (Health Sci. Cent, Oklahoma Univ., Oklahoma City, OK) **Effects of chlordimeform on vascular tissue.** *US NTIS PB Rep.* PB-116,817: 66 pp.; 1979 (41 references).

In order to fully understand potential risk to human beings of exposure to a chemical one needs to understand the effects of that chemical upon each organ system and to determine its mode of action. For some classes of pesticides their primary mode of toxicity has been established. An example of this is the organophosphorus cholinesterase inhibitors. There is general agreement that their acute lethality and most of their toxicities result from cholinesterase inhibition and subsequent acetylcholine accumulation. Even among this group of compounds, however, there are toxic effects which seem to be due to other actions. For other classes of compounds much less is known of their mechanisms of lethality and effects on organ systems. An example of this is the formamidines, the first useful one of which was chlordimeform. Little information on the mode of action of chlordimeform was available, and on its other effects. This study was initially proposed to determine vascular actions of chlordimeform. The project was expanded to examine the cardiovascular actions of other available formamidines including formamidine metabolites which also retained the formamidine structure. (Author abstract by permission)

80-2955. Birge, W. J.; Black, J. A.; Kuehne, A. (Kentucky Water Resour. Inst., Lexington, KY) **Effects of**

organic compounds on amphibian reproduction. *US NTIS PB Rep.* PB-147,523: 50 pp.; 1980 (44 references).

Aquatic toxicity tests were conducted with atrazine, carbon tetrachloride, chloroform, methylene chloride, trisodium nitrilotriacetic acid (NTA), and phenol. Each compound was administered to development stages of 3-5 amphibian species. Exposure was initiated at fertilization and maintained through 4 days posthatching. Test responses included lethality and teratogenesis. Different amphibian species exhibited varying degrees of tolerance to the selected compounds. Greatest tolerance usually was observed for the more broadly adapted semiaquatic and terrestrial species *(Bufo americanus, Bufo fowleri).* The more sensitive amphibians usually included those species which normally are restricted to aquatic or moist habitats *(Rana catesbeiana, Rana pipiens).* Median lethal concentrations (mg/l) determined at 4 days posthatching ranged from 0.41 to 48 for atrazine, 0.90 to 2.83 for carbon tetrachloride, 0.27 to 35.14 for chloroform, 17.78 to > 32 for methylene chloride, 39.3 to 252.3 for NTA, and 0.04 to > 0.89 for phenol. The most toxic compounds always included phenol, carbon tetrachloride, and atrazine, and the least toxic consistently were NTA and methylene chloride. For 3 chlorinated alkanes, including methylene chloride, chloroform, and carbon tetrachloride, toxicity increased with chlorination. Toxicity of the different compounds was further characterized by calculating concentrations which produced embryolarval lethality or teratogenesis at frequencies of 10% and 1%. (Author abstract by permission)

80-2956. Davis, D. E.; Weete, J. D.; Pillai, C. G.; Plumley, F. G.; Everest, J. W.; Truelove, B.; Diner, A. M. (Dep. Bot. & Microbiol., Auburn Univ. Agric. Exp. Stn., Auburn Univ., Auburn, AL) **Atrazine fate and effects in a salt marsh.** *US NTIS PB Rep.* PB-150,634: 100 pp.; 1979 (93 references).

Components of the *Spartina alterniflora* salt marsh were exposed to atrazine individually, in microecosystems, and in the field, to determine its effects on salt marsh components and its fate in the salt marsh. Components studied were *S. alterniflora*; horse mussel, *Geukensia demissa*; periwinkle snail, *Littorina irrorata*; box crab, *Sesarma cinereum*; fiddler crab, *Uca pugnax*; diatom spp, including *Nitzschia sigma* and *Thallassiosira fluviatilis*; detritivores, soil, and tidal water. Only algae were affected by possible contaminant concentrations (0.01 ppm) in seawater in the marsh. *S. alterniflora* was fairly tolerant but 0.1 ppm decreased growth slightly. Adult *U. pugnax* at their most sensitive stage may have been slighty affected by 100 ppm. *S. cinereum* was unaffected when fed leaves from *S. alterniflora* grown in nutrient solution containing 0.6 ppm atrazine. Conversion to detritus was unaffected when *S. alterniflora* leaves were wetted with 0.26 ppm atrazine solution. No effects on snails or mussels were detected when the marsh was sprayed with 5 g/m² atrazine. Atrazine was metabolized by *S. alterniflora, S. cinereum, U. pugnax,* and detritivores. Three months after atrazine application to the marsh the total herbicide remaining in the soil, *S. alterniflora, L. irrorata, U. pugnax,* and *G. demissa* was less than 3% of that applied. Seventy days after atrazine application to microecosystems, 50% had removed in tidal water; 42% within the first 6 days. (Author abstract by permission)

80-2957. Johnson, W. W.; Julin, A. M. (Fish Pestic. Res. Lab., US Fish & Wildl. Serv., Columbia, MO 65201) **Acute toxicity of toxaphene to fathead minnows, channel catfish, and bluegills.** *US NTIS PB Rep.* PB-152,796: 32 pp.; 1980 (44 references).

Toxaphene was very toxic to fathead minnows *(Pimephales promelas),* channel catfish *(Ictalurus punctatus),* and bluegills *(Lepomis macrochirus)* in static tests; 96 hr LC50's ranged from 2.6 to 20 μg/l at 20°C. Fathead minnows were the least susceptible and bluegill and channel catfish were about equal in susceptibility. Prolonged exposure of 12-34 days in flow-through tests produced time-dependent LC50 values of 0.6-1.9 μg/l, significantly lower than the 96 hr values. The toxicity of toxaphene was not influenced by variations in pH or water hardness in static tests. Temperature seemed to influence rate of onset rather than degree of response. Toxicities were similar at 20 and 25°C in flow-through tests, however, a decrease in the time required for mortality to become asymptotic with time was observed. Time-independence was reached after 7-16 days of exposure at 25°C while 24-34 days were required at 20°C. The life stage of channel catfish most sensitive to toxaphene poisoning was the swim-up fry with a 96 hr LC50 of 0.8 μg/l. Early yolk sac fry were extremely resistant with a 24 hr LC50 of 4.7 mg/l, however, within 96 hr the yolk had adsorbed and the LC50 had declined to 8.0 μg/l. (Author abstract by permission)

80-2958. Sanders, H. O. (Fish-Pestic. Res. Lab., Fish & Wildl. Serv., Columbia, MO 65201) **Sublethal effects of toxaphene on daphnids, scuds, and midges.** *US NTIS PB Rep.* PB-153,554: 27 pp.; 1980 (29 references).

Daphnids *(Daphnia magna),* scuds *(Gammarus pseudolimnaeus),* and midge larvae *(Chironomus plumosus)* were continuously exposed to toxaphene in a flow-through system. Exposure to daphnids for a complete life cycle (21 days) to 0.12, 0.28, 0.54 and 1.0 μg/l of toxaphene significantly ($P < 0.05$) reduced production of young; the no-effect concentration was 0.07 μg/l. Toxaphene concentrations of 0.25 μg/l and greater significantly ($P < 0.05$) reduced growth of scuds and concentrations of 3.2 μg/l and greater significantly ($P < 0.05$) reduced emergence of midges. The no-effect concentrations were 0.13 μg/l for growth of scuds and 1.0 μg/l for emergence of midges. Daphnids continuously exposed to toxaphene accumulated residues after 7 days that were 4000 times (based on organism wet wt) the water concentration of 0.06 μg/l.

Whole body residues in midge larvae were below the minimum detection limit of 0.1 μg/g. Maximum acceptable toxicant concentrations (MATC) of toxaphene for the 3 species of aquatic invertebrates were estimated using reproduction of daphnids, growth of scuds, and emergence of midges as indicators of toxic effects. The MATC was estimated to be between 0.07 and 0.12 μg/l for daphnids, between 0.13 and 0.25 μg/l for scuds, and between 1.0 and 3.2 μg/l for midges. (Author abstract by permission)

80-2959. Koransky, W. (Inst. Toxikol. & Pharmakol., Philipps Univ., Marburg/L., BRD) **Specific working paper.** In: *The Use of Biological Specimens for the Assessment of Human Exposure to Environmental Pollutants.* Berlin, A., Wolff, A. H. and Hasegawa, Y., eds. (Martinus Nijhoff: The Hague): pp. 243-245; 1979.

The organochlorine pesticides are of interest in biological monitoring programs because of their ability to bioaccumulate. The metabolites of DDT, BHC, hexachlorobenzene, aldrin and PCB are excreted from mammals mainly in the urine. In general they are not very toxic to humans, but in cases of poisoning affect mainly the nervous system. Certain disorders may accompany exposure to these compounds over a number of years, but the mechanisms for their occurrence is not yet known. Many organochlorine compounds damage the liver and upset enzyme systems of animals and humans. A few organochlorine pesticides were linked with an increased incidence of tumors in laboratory animals. Safe or threshold levels for the various routes of exposure to the organochlorine pesticides have not yet been discerned for humans. The samples which show potential for use in biological monitoring for environmental pollution by the organochlorine pesticides are discussed.

80-2960. Hoagland, R. E. (South. Weed Sci. Lab., SEA, ARS, USDA, Stoneville, MS 38776) **Effects of glyphosate on metabolism of phenolic compounds: VI. Effects of glyphosine and glyphosate metabolites on phenylalanine ammonia-lyase activity, growth, and protein, chlorophyll, and anthocyanin levels in soybean *(Glycine max)* seedlings.** *Weed Sci.* 28(4): 393-400; 1980 (49 references).

The growth regulator, glyphosine [*N,N*-bis(phosphonomethyl) glycine], and other possible metabolites of glyphosine and glyphosate [*N*-(phosphonomethyl) glycine] [glycine, sarcosine, and aminomethylphosphonic acid (AMPA)] were tested individually (0.5 m*M*) or as a mixture (each at 0.5 m*M*) for their effects on growth, extractable phenylalanine ammonia-lyase (PAL) activity, hydroxyphenolic- compound production, chlorophyll and anthocyanin contents, and on soluble-protein levels in soybean [*Glycine max* (L.) Merr. Hill] seedlings. Most chemical treatments caused some inhibition of growth either on fresh weight accumulation or on root elongation in the light and dark over 72 hr. Glyphosine was generally the most inhibitory and caused the greatest inhibition on axis dry-weight accumulation. Glyphosine significantly increased extractable PAL activity in axes of light- and dark-grown soybeans to a lesser extent than did glyphosate. AMPA had some inhibitory effects on extractable PAL activity whereas other compounds had little influence on the enzyme. These compounds had little effect on total soluble protein in axes or on soluble protein in PAL preparations from 12 to 72 hr in light- or dark-grown seedlings. No *in vitro* effect of the chemicals on PAL activity was found at concentrations up to 0.5 m*M*. Hydroxyphenolic compound levels increased within 24 to 72 hr (per g fresh wt basis) in light- or dark-grown soybean axes treated with glyphosine, AMPA, or a metabolite mixture (AMPA, sarcosine, and glycine). Anthocyanin content was decreased by glyphosate and to a lesser extent by glyphosine, but was increased by AMPA and the mixture. Glyphosate significantly increased the chlorophyll *a/b* ratio and decreased total chlorophyll content to a lesser degree. (Author abstract by permission)

80-2961. Pringle, J. C., Jr.; Anderson, L. W. J. (Aquat. Weed Control Lab., ARS, SEA, USDA, Denver, CO 80225) **Movements of herbicides through isolated American pondweed *(Potamogeton nodosus)* epidermal tissues.** *Weed Sci.* 28(4): 419-424; 1980 (14 references).

Enzymatically isolated American pondweed *(Potamogeton nodosus* Poir.) epidermal tissues were exposed to ^{14}C-labeled dichlobenil (2,6-dichlorobenzonitrile), diquat (6,7-dihydrodipyrido[1,2- *a*:2′,1′-*c*] pyrazinediium ion), silvex [2-(2,4,5-trichlorophenoxy] propionic acid] or 2,4-D [(2,4-dichlorophenoxy)acetic acid] at concentrations of 5×10^{-4}, 5×10^{-5}, and 5×10^{-6} *M*, and the amount of herbicide crossing the tissue layer was measured. Rates of herbicide movement were compared to those found when copper sulfate pentahydrate was added as a potential synergist at concentrations of 5×10^{-5} *M* (12.5 ppm), 5×10^{-6} *M* (1.25 ppm), and 5×10^{-7} *M* (0.125 ppm). Copper sulfate as 5×10^{-6} *M* increased the rate of movement of all herbicides. However, diquat and dichlobenil exhibited the most enhanced movement in the presence of copper sulfate. Without copper sulfate, 0.1 nmol of 5×10^{-6} *M* ^{14}C diquat penetrated the tissue within 24 hr, compared to 1.3 nmol following the addition of 5×10^{-7} *M* of copper sulfate. (Author abstract by permission)

80-2962. Sanborn, H. R.; Malins, D. C. (Environ. Conserv. Div., Northwest & Alaska Fish. Cent., Natl. Mar. Fish. Serv., NOAA, Seattle, WA 98112) **The disposition of aromatic hydrocarbons in adult spot shrimp *(Pandalus platyceros)* and the formation of metabolites of naphthalene in adult and larval spot shrimp.** *Xenobiotica* 10(3): 193-200; 1980 (22 references).

Adult spot shrimp *(Pandalus platyceros)* exposed to 110 ppb (μg/l) of the water-soluble fraction of Prudhoe Bay crude oil for 1 wk accumulated a variety of low molecular wt aromatic hydrocarbons (primarily C_1-C_3 substituted derivatives) in thoracic and abdominal tissues. Adult an larval spot shrimp were exposed to ^3H- and ^{14}C-labelled naphthalene (a component of the water-soluble fraction) in seawater to delineate the types of metabolites formed. Both adults and larvae converted naphthalene to conjugated and non-conjugated structures such as the glucuronide, sulfate, dihydrobiol and phenolic derivatives. The presence of a quinone was also indicated. (Author abstract by permission)

80-2963. Schnell, J. V.; Gruger, E. H., Jr.; Malins, D. C. (Environ. Conserv. Div., Northwest & Alaska Fish. Cent., Natl. Mar. Fish. Serv., NOAA, Seattle, WA 98112) **Mono-oxygenase activities of coho salmon *(Oncorhynchus kisutch)* liver microsomes using three polycyclic aromatic hydrocarbon substrates.** *Xenobiotica* 10(3): 229-234; 1980 (32 references).

Benzo[a]pyrene, 2,6-dimethylnaphthalene, and naphthalene were used as substrates for a coho salmon *(Oncorhynchus kisutch)* liver microsomal preparation. The apparent Michaelis constant (*K*m) were as follows; benzo(a)pyrene, 2.1 μ*M*; 2,6-dimethylnaphthalene, 15.3 μ*M*; and naphthalene, 300 μ*M*. The results indicate that the microsomal preparation had a high affinity for 2,6-dimethylnaphthalene. Thus, 2,6-dimethylnaphthalene, an important constituent of petroleum products, is a useful substrate for research on the disposition *in vivo* and *in vitro* of xenobiotics introduced into marine environments by petroleum pollution. (Author abstract by permission)

80-2964. El-Hissy, F. T.; Abdel-Kader, M. I. A. (Bot. Dep. Fac. Sci., Assiut Univ., Assiut, Egypt) **Effect of five pesticides on the mycelial growth of some soil and pathogenic fungi.** *Z. Allg. Mikrobiol.* 20(4): 257-263; 1980 (20 references).

Cultures of *Aspergillus fumigatus* Fres., *Fusarium moniliforme* Sheldon, *Penicillium italicum* Wehmer, and *Sclerotium cepivorum* Berk were exposed to 3 doses of Ceresan (ethyl mercury chloride), Orthocid, VCS-438 (methazole), Dursban (chlorpyrifos), or Dipterex (trichlorfon). The mycelial dry weights of the soil and pathogenic fungi were measured on days 2, 4, 6, 8 and 10 after treatment. Mycelial growth was inhibited by each of the chemicals. Only VCS-438 at the lowest dose was stimulating to *F. moniliforme* after 4 and 6 days and to *P. italicum* after 4 days. The type of fungus, age of the mycelium, and pesticide dose each influenced the rate of inhibition. The 2 fungicides, Ceresan and Orthocid, which were extremely poisonous at the start of the experiments, were generally detoxified by the test fungi at a rate higher than the other pesticides.

80-2965. Israeli, R.; Potashnik, G. (Dep. Occup. Health, Fac. Health Sci., Ben Gurion Univ., Beer-Sheva, Israel) **Schaedigung der Spermatogenesis bei Exposition gegenueber 1,2-Dibromo-3-Chloropropan (DBCP) as Warnung fuer die Zukunft. [Impairment of spermatogenesis by exposure to DBCP: a warning for the future.]** *Zentralbl. Arbeitsmed.* 30(1): 20-22; 1980 (4 references) (German).

Following reports of testicular damage by DBCP in the United States, a study was conducted on 30 men working at an Israeli factory which manufactured DBCP intermittently. Total azoospermia was diagnosed in 18 men. These workers also had elevated plasma FSH but normal plasma LH and testosterone levels. Testicular biopsies, performed in 6 of these individuals, revealed total disappearance of sperm cells in the seminiferous tubules, with enlarged Sertoli cells and thickening of the tubular membranes. Hormone patterns were normal in the 6 oligospermic workers. The degree of abnormality was correlated with the time of total exposure to DBCP. Heavily exposed operators also reported symptoms such as impotence, sterility and loss of libido. Animal experiments as early as 1961 had indicated the possibility of DBCP causing abnormalities.

80-2966. Wendel, K.-G. (Univ. Essen, Essen, BRD) **Rhizospharenorganismen unter dem Einfluss pestizider Umweltbelastungen. II. Physiologische Leistungen der mikrobiellen Biozoenose in fungizid belasteten Boeden. [Rhizospheric organisms under the influence of environmental pollution. II. Physiologic efficiency of the microbial biocenosis in fungicide containing soil.]** *Zentralbl. Bakteriol. Parasitenkd. Infektionskr. Hyg. 1 Abt. Orig. Reihe B* 168(3-4): 291-330; 1979 (43 references) (German).

In soils treated with dithiocarbamic acid derivatives, the fungicides appeared to have varying influences. The activity of the cellulase systems was reduced, with the degree of reduction being dependent on the active ingredient of the fungicide and on the concentration used. Respiration was stimulated. Amounts of pesticides used in the studies were 0.75 to 1.5 times the quantity used in practical situations. No inhibition of the 1,4-glucodimerase or high respiration values were obtained in these open field tests.

80-2967. Zimmermann, W.; Kuhnen, U.; Lehnen, M.; Schubert, K.; Rurainski, R. D. (Inst. Hyg. & Mikrobiol., Univ. Saarlandes, Homburg-Saar, BRD) **Infektion als Indikator zur schnellen Feststellung komplexer Umweltnoxen. [Infection as indicator of finding complex environmental noxious agents within a short time.]** *Zentralbl. Bakteriol. Parasitenkd. Infektionskr. Hyg. Abt. 1 Orig. Reihe B* 168(5-6): 387-394; 1980 (12 references) (German).

Guinea pigs were exposed to 3 environmental poisons (automobile emissions, lead and DDT) to

demonstrate that the damage caused was clinically undetectable in the short term, but could be measured by means of an indicator (infection with *S. typhimurium*) and by changes in steroid metabolism. Environmental damage operative over long periods of time without visible symptoms is demonstrated by this method and quantified by a shortening of life and a change in steroid metabolism following infection. The method detects the adverse cumulative effect of mixtures of environmental poisons within 2 to 3 wk instead of having to wait for several years before the appearance of clinical symptoms. Screening and survival tests generally suffice without need for steroid analysis; the statistical significance of survival tests is determined mathematically. An infectious dose of a low virulence strain of *S. typhimurium* is chosen which causes fewer than 50% of infected animals to die within 8 to 10 days. Where environmental poisons are operative survival is < 8 to 10 days.

See also 80-2704, 80-2707, 80-2710, 80-2712, 80-2715, 80-2716, 80-2718, 80-2720, 80-2722, 80-2723, 80-2724, 80-2725, 80-2730, 80-2731, 80-2737, 80-2741, 80-2745, 80-2746, 80-2747, 80-2749, 80-2762, 80-2765, 80-2785, 80-2797, 80-2800, 80-2809, 80-2811, 80-2821, 80-2827, 80-2837, 80-2839, 80-2841, 80-2842, 80-2849 *and* 80-2850.

80-2968. Zabban, W. (Chester Engineers, Coraopolis, PA 15108) **Manual and in-line monitoring of priority pollutants.** *AIChE Symp. Ser.* 197(76): 16-24; 1979 (44 references).

A review of the instrumentation used for the detection of priority pollutants in water and wastewater is presented. For determining the presence and amounts of metals, atomic absorption, colorimetry and ion-selective electrodes are used; for cyanides, colorimetry and ion-selective electrodes are used; and for organics, liquid and gas chromatography are used. Subdivision of the organics into the categories, pesticides, acid extracted, alkaline extracted and neutral extracted compounds, total phenols, and purgeable compounds allows easier sampling and analysis. High pressure liquid chromatography, gas chromatography with mass spectrometry, and liquid chromatography methods are described in detail. The techniques currently available for the best determinations from each of these methods are listed.

80-2969. Kuwabara, K.; Suzuki, T.; Meguro, H. (Lab. Anal. Chem., Fac. Agric., Tohoku Univ., Sendai, Japan) **A simple determination method for herbicides, NIP and CNP in soil using single ion monitoring mass spectrometry.** *Agric. Biol. Chem.* 44(5): 1195-1196; 1980 (5 references).

Air-dried soil fortified with NIP (nitrofen) and CNP was shaken with water/*n*-hexane (1:1), then the residue after decantation shaken with *n*-hexane three additional times. Organic layers were evaporated to dryness. The residue was taken up in acetone, and after evaporation of the solvent, the residue was directly introduced to the mass spectrometer. The instrument used was a JMS-06 mass spectrometer, with accelerating voltage of 1.75 kV, ionizing voltage of 75 eV, ionizing current of 300 A, and chamber temperature of 200°C. Both NIP and CIP gave strong molecular peaks as the base peaks. NIP and CNP recoveries were 90-103% from two soil types. With an accelerating voltage of 2.35 kV, detection limits were 0.05 ppm for both fungicides. In the GLC method, extraction of the fungicide was more difficult; CNP and NIP were poorly separated, and the background peaks were complicated. Use of an improved mass spectrometer could improve the sensitivity by 100 fold.

80-2970. Tomita, Y.; Guilbault, G. G. (Dep. Chem., Univ. New Orleans, New Orleans, LA 70122) **Coating for a piezoelectric crystal sensitive to organophosphorus pesticides.** *Anal. Chem.* 52(9): 1484-1489; 1980 (22 references).

A piezoelectric quartz crystal coated with 3-PAD, Trifon X-100 and NaOH, was found to be a sensitive detector for assay of organophosphorus compounds possessing properties of high sensitivity, selectivity, response time in the order of seconds, and long lifetime. Several coatings were screened for response to organophosphorus compounds: 2- and 3-PAD, 2-PAM, histidine hydrochloride, and succinyl choline salts were the most reactive and selective. Of these, 3-PAD was the best coating for compounds with the G agent structure, and histidine hydrochloride for compounds of the malathion type. (Author abstract reprinted by permission of the American Chemical Society)

80-2971. Min. Agric. Fish. & Food, Harpenden, Hertfordshire AL5 2BD, England **Determination of a range of organophosphorus pesticide residues in grain.** *Analyst (London)* 105(1250): 515-517; 1980 (4 references).

The possible wider applicability of a method used for determination of malathion and dichlorvos in grain was studied. Samples of ground and whole wheat spiked individually with the pesticides dimethoate, fenitrothion, phorate sulfoxide or phorate, diazinon, pirimiphos-methyl, malathion, bromophos, iodofenphos and disulfoton. Single samples were analyzed gas chromatographically in 7 different laboratories. Recoveries from ground wheat averaged 70-80% with a coefficient of variation of about 20%. Phorate sulfoxide and disulfoton recoveries, however, were lower and imprecise. The mean recovery from whole wheat was 80%, with a mean coefficient of variation of 15%. The method was concluded to be satisfactory for determining organophosphorus pesticide residues in grain. However, further work on a more definitive method is recommended.

80-2972. Fanelli, R.; Bertoni, M. P.; Bonfanti, M.; Castelli, M. G.; Chiabrando, C.; Martelli, G. P.; Noe, M. A.; Noseda, A.; Sbarra, C. (Ist. Ric. Farmacol. Mario Negri, I-62-20157 Milan, Italy) **Routine analysis of 2,3,7,8-tetrachlorodibenzo-*p*-dioxin in biological samples from the contaminated area of Seveso, Italy.** *Bull. Environ. Contam. Toxicol.* 24(6): 818-823; 1980 (15 references).

The need to monitor TCDD (dioxin) concentration in the food chain in the chemical accident at the area of Seveso, Italy, called for the development of a sensitive method suitable for routine analysis. Rabbit liver was selected as the optimal material for analysis because of its relatively high TCDD and low fat contents. Samples were hydrolyzed by refluxing for 1 hr with sodium hydroxide and ethanol, then extracted twice with *n*-hexane. Extracts were cleaned up on a kieselguhr column saturated with sulfuric acid; the column was washed with *n*-hexane, and the residue following evaporation of the eluate was chromatographed on an alumina microcolumn. The column was eluted with carbon tetrachloride and chloroform; the chloroform was evaporated, and the residue, dissolved in diethylene dioxide, was subjected to GC-MS analysis. All of the 341 rabbit liver samples collected in areas surrounding the chemical plant within 6 mo of the accident contained TCDD at 0.25-1024 ng/g, with an average concentration of 31 ng/g.

80-2973. Brun, G. L.; MacDonald, R. M. (Inland Waters Dir., Dep. Environ., New Brunswick EIC 8N6, Canada) **Determination of aminocarb in water by high performance liquid chromatography.** *Bull. Environ. Contam. Toxicol.* 24(6): 886-893; 1980 (13 references).

A method of detecting aminocarb in water was described. The technique involved reverse phase high performance liquid chromatography (HPLC) using UV absorbance in series with fluorescence detection. The water sample was poured through a resin column (Amberlite XAD-4, 20-50 mesh) and eluted with ethyl acetate. After extraction, a fluorescence trace of aminocarb and its respective phenolic product was visible. Optimum excitation was found at 248 nm with a 7-54 narrow band-pass filter and a cut-off filter greater than 370 nm selected for emission. The authors contend that this technique could be modified to screen for the presence of decomposition products or metabolites in a variety of substrates.

80-2974. Gunther, F. A.; Iwata, Y.; Papadopoulou, E.; Berck, B.; Smith, C. A. (Dep. Entomol., Univ. California, Riverside, CA 92521) **Rapid field method for estimating organophosphorus insecticide residues on crop foliage.** *Bull. Environ. Contam. Toxicol.* 24(6): 903-909; 1980 (3 references).

A method is presented by which organophosphorus insecticide residues on crops can be estimated in the field. Discs from leaves collected with a leaf punch are rinsed with hexane. A portion of the hexane is then added to a solution of 4-(*p*-nitro-benzyl) pyridine and oxalic acid in acetone, heated, cooled, then mixed with triethylamine. After mixing with prescribed concentrations of Na_2CO_3 and NaCl, absorbance is measured at 560 nm in a spectrophotometer. Sample absorbance values can be compared to prepared standards. The procedure can be used for a variety of pesticides and can be conducted on 24 samples in 90 min. The technique can be modified for use on soil samples.

80-2975. Tessari, J. D.; Griffin, L.; Aaronson, M. J. (Colorado Epidemiol. Pestic. Stud. Cent., Coll. Vet. Med. & Biomed. Sci., Colorado State Univ., Fort Collins, CO 80523) **Comparison of two cleanup procedures (Mills, Onley, Gaither *vs* automated gel permeation) for residues of organochlorine pesticides and polychlorinated biphenyls in human adipose tissue.** *Bull. Environ. Contam. Toxicol.* 25(1): 59-64; 1980 (5 references).

A comparison of two procedures for cleanup of human adipose tissue to find a fast and efficient method for analyzing organochlorine pesticides and PCB compounds is presented. The methods compared were Mills, Onley and Gaither (MOG) and automated gel permeation (AGPC). Five g of each tissue sample were extracted with hexane. Samples for the MOG method were partitioned with acetonitrile and cleaned up with florisil. Samples for the AGPC method were first rotary evaporated, then further evaporated under nitrogen, and adjusted to a 10 ml final volume. Samples were injected into the AGPC AutoPrep 1001 prior to analysis by gas chromatography. Three compounds of the 21 tested were significantly higher in concentration in the AGPC method (aldrin 7%, DDT 13%, and hexachlorobenzene 28%). The other compounds tested were comparable in both methods. The AGPC method is considered to be as good as, if not better than, the traditional method. The newer method uses about half the reagents and reduces cleanup time by 9.5 hr/sample.

80-2976. Muir, D. C. G. (Freshwater Inst., Dep. Fish & Oceans, Winnipeg, Manitoba R3T 2N6, Canada) **Determination of terbutryn and its degradation products in water, sediments, aquatic plants, and fish.** *J. Agric. Food Chem.* 28(4): 714-719; 1980 (18 referenccs).

A method is described for the determination of terbutryn [2-(*tert*-butylamino)-4-(ethylamino)-6-(methylthio)-*s*-triazine] and several of its degradation products, *N*-deethylated terbutryn (DET), hydroxyterbutryn (HT), *N*-deethylated hydroxyterbutryn (DEHT), 2-(*tert*-butylamino)-4-ethylamino)-*s*-triazine (EBT), and 2-(*tert*-butylamino)-4-amino-*S*-triazine (ABT), in samples from the aquatic environment. Water samples were extracted with dichloromethane, while sediment, aquatic plants, and fish tissues were extracted with aqueous acetonitrile. The hydroxytriazines were isolated by chromatography on a cation-exchange resin and cleanup on alumina and by high pressure liquid chromatography. Recoveries of terbutryn, DET, HT, DEHT, ABT, and EBT from water (0.5-50 μg/l) ranged from 76 to 120%. Terbutryn and DET recoveries from sediment, plant material, and fish tissues (0.05-0.9 μg/g) ranged from 74 to 106%. HT and DEHT recoveries from sediment, plant material, and fish tissue (0.1-1.23 μg/g) ranged from 62 to 124%. (Author abstract reprinted by permission of the American Chemical Society)

80-2977. Lee, Y. W.; Westcott, N. D.* (Res. Stn., Res. Branch, Agric. Canada, Saskatoon, Saskatchewan S7N 0X2, Canada) **Direct analyses of carbofuran and 3-hydroxycarbofuran in rape plants by reverse-phase high-pressure liquid chromatography.** *J. Agric. Food Chem.* 28(4): 719-722; 1980 (9 references).

Rape plants spiked with both carbofuran and 3-hydroxycarbofuran were digested in acid solution and extracted with methylene chloride. The concentrated methylene chloride extract was passed through a cleanup column that contained silica gel and carbon-attaclay. The eluant of the first cleanup column was concentrated and passed through a silica gel column, and fractions containing carbofuran and 3-hydroxycarbofuran were collected and evaporated separately prior to the addition of internal standard. Carbofuran and 3-hydroxycarbofuran were

measured separately by reverse-phase high pressure liquid chromatography with an aqueous methanol mobile phase. Detection was carried out at 280 nm for carbofuran, 3-hydroxycarbofuran, and internal standards. The detection limit in rape plants studied was about 0.2 ppm for both carbofuran and 3-hydroxycarbofuran. Recoveries averaged 81.3% for carbofuran and 82.7% for 3-hydroxycarbofuran in the 0.2-1.0 ppm range. (Author abstract reprinted by permission of the American Chemical Society)

80-2978. Lapp, R. L.; Jacobson, R. A. (Ames Lab., US Dep. Energy, Ames, IA 50011) **Crystal and molecular structures of organophosphorus insecticides. 13. *S*-Isopropyl *O*-methyl *O*-(3,5,6-trichloro- 2-pyridyl) phosphoramidothioate and dimethoate.** *J. Agric. Food Chem.* 28(4): 755-759; 1980 (32 references).

The crystal and molecular structures of *S*-isopropyl- *O*- methyl- *O*-(3,5, 6-trichloro-2-pyridyl) phosphor amidothioate, $C_9H_{12}N_2O_2PSCl_3$, and dimethoate [*O,O*-dimethyl- *S*-(*N*-methylcarbamoyl) methylphosphorodithioate], $C_5H_{12}NO_3PS_2$, have been determined by three dimensional X-ray analysis. The former compound crystallizes in the triclinic space group P_1 with $a = 103.19$ (5) nm, $b = 107.30$ (6) nm, $c = 84.4$ (4) nm, $\alpha = 99.01$ (2)°, $\beta = 114.02$ (1)°, and $\gamma = 62.64$ (1)° with $Z = 2$, and the latter compound crystallizes in the monoclinic space group $P2_1$ with $a = 6.574$ (2) nm, $b = 9.354$ (2) nm, c = 9.885 (2) nm, and $\beta = 107.4$ (2)° with two molecules per unit cell. The structures were refined by a full matrix, least squares procedure to final residual indices of $R = 0.058$ and 0.068, respectively, using reflections with $F_o > 3\sigma(F_o)$. Atomic charge densities were calculated via CNDO/2 methods in order that positive charge center separations as well as geometric factors could be compared between these insecticides, acetylcholinesterase, and previous insecticides studied in this series. (Author abstract reprinted by permission of the American Chemical Society)

80-2979. Tessari, J. D.; Savage, E. P. (Inst. Rural Environ. Health, Colorado Epidemiol. Pestic. Stud. Cent., Coll. Vet. Med. & Biomed. Sci., Colorado State Univ., Fort Collins, CO 80523) **Gas-liquid chromatographic determination of organochlorine pesticides and polychlorinated biphenyls in human milk.** *J. Assoc. Off. Anal. Chem.* 63(4): 736-741; 1980 (18 references).

A method for the detection of organochlorine pesticides and polychlorinated biphenyls (PCBs) in human milk is described. The method involves quantitative extraction of human milk with acetone and hexane. The pesticide and PCB residues are extracted from the milk fat with acetonitrile (ACN) and then partitioned back into hexane by aqueous dilution of the ACN extract. The ACN partitioning is followed by cleanup with Florisil column chromatography, eluting with 6 and 15% mixtures of ethyl ether-hexane. The 6% eluate is concentrated and transferred to a silica acid column for separation of PCBs from pesticide residues. Compounds are quantified by gas-liquid chromatography. Recovery studies demonstrated that the procedure provides 68-103% recovery for pesticides and PCBs. (Author abstract by permission)

80-2980. Iadevaia, R.; Aharonson, N.; Woolson, E. A. (Pestic. Degradation Lab., Agric. Environ. Qual. Inst., USDA, Beltsville, MD 20705) **Extraction and cleanup of soil arsenical residues for analysis by high pressure liquid chromatography-graphite furnace atomic absorption.** *J. Assoc. Off. Anal. Chem.* 63(4): 742-746; 1980 (12 references).

An analytical procedure for the extraction and cleanup of arsenical residues from soil was developed to meet the specific requirements for separation by high pressure liquid chromatography (HPLC) and on-line analysis by a graphite furnace atomic absorption spectrophotometer (GFAA). Soil samples were extracted with 2 *M* aqueous NH_4OH, cleaned on a carbon-Celite chromatographic column, concentrated to 1 g soil extract equivalent per ml, and determined by HPLC-GFAA. Recovery values were as follows; dimethylarsinic acid (cacodylic acid, CA) 90%; methanearsonic acid (MAA) 83%; arsenate 56%; and arsenite 64%. The limit of detection was 0.5 ppm on soil. Additional cleanup on cellulose thin layer chromatographic (TLC) plates improved sensitivity to less than 0.1 ppm and also served for confirmation of identity. The soil extract matrix did not appear to affect GFAA signal response. High salt content in concentrated soil samples altered the dimethylarsinic acid HPLC retention volume. By the time of analysis, arsenite was completely oxidized to arsenate in soil extract. (Author abstract by permission)

80-2981. Isshiki, K.; Tsumura, S.; Watanabe, T. (Kitakyushu Munic. Inst. Environ. Health Sci., Tobata-ku, Kitakyushu 804, Japan) **High performance liquid chromatography of thiabendazole residues in banana and citrus fruits.** *J. Assoc. Off. Anal. Chem.* 63(4): 747-749; 1980 (13 references).

A simple high performance liquid chromatographic (HPLC) method for determining thiabendazole in fruits has been developed. Thiabendazole is extracted with methanol and the extract is washed with *n*-hexane saturated with methanol. The determination is carried out by HPLC with fluorometric detection. LiChrosorb RP-8 is used as stationary phase and methanol-0.28% ammonia water (60 + 40) as mobile phase; α-methylindole is added as an internal standard. The limit of detection of this method is 0.1 μg thiabendazole/g. Recoveries are more than 92%. (Author abstract by permission)

80-2982. Lawrence, J. F. (Health & Welfare Canada, Health Prot. Branch, Food Res. Div., Tunney's Pasture, Ottawa, Ontario K1A OL2, Canada) **Simple, sensitive, and selective thin layer chromatographic technique for detecting some photosynthesis inhibiting herbicides.** *J. Assoc. Off. Anal. Chem.* 64(4): 758-761; 1980 (21 references).

Photosynthesis inhibiting herbicides such as triazines, phenylureas, phenylcarbamates, uracils, and acyl anilides are detected after thin layer chromatography (TLC) by spraying the plate with a mixture of spinach or bean leaf chloroplasts and the redox indicator 2,6-dichloroindophenol. The chloroplasts are isolated by homogenizing the fresh leaves with 0.5 *M* sucrose solution. The filtrate is centrifuged, and the chloroplast plug is resuspended in glycerol-water (1 + 9) for preparation of the TLC spray. Minimum detectable levels of most ureas, triazines, and anilides are about 100-500 pg/spot. The selectivity of the reaction is such that the bipyridilium, phenoxyacid, and wild oat herbicides are negative. All insecticides tested (carbamates, organophosphates, organochlorines) were negative. In samples such as potatoes, carrots, and corn, detection limits with no cleanup were 1 ppb or less for linuron or 5-10 ppb for atrazine. (Author abstract by permission)

80-2983. Grorud, R. B.; Stevens, T. S. (State Lab. & Consumer Affairs, Bismarck, ND 58505) **Isomer specific assay of ester and salt formulations of 2-methyl-4-chlorophenoxyacetic acid and 2,4,5-trichlorophenoxyacetic acid by high pressure liquid chromatography: collaborative study.** *J. Assoc. Off. Anal. Chem.* 63(4): 873-878; 1980 (2 references).

HPLC methodology for ester and salt formulations of 2-methyl-4-chlorophenoxyacetic acid (MCPA) and 2,4,5-trichlorophenoxyacetic acid (2,4,5-TA; 2,4,5-T) has been substantiated in 2 collaborative studies. The methods closely follow the AOAC method for 2,4-dichlorophenoxyacetic acid (2,4-DA; 2,4-D), including preparation of samples by addition of a saponification internal standard solution to all samples. A microparticulate column in the reverse phase ion suppression mode separates all known impurities from the internal standard and MCPA, or 2,4,5-TA. The only differences in essential parameters between the 2 methods concern the internal standard, strength of solvent (acetonitrile), and pH of the acidic buffered eluant. One of the test samples is a combination of 2,4,5-T and 2,4-DA as an ester formulation and each herbicide is quantitated on the same chromatogram. In respective acid equivalent, the coefficient of variation ranged from 1.67% for the 45% 2,4,5-TA ester formulation to 2.36% for the 22% 2,4,5-TA component in the combination ester formulation of 2,4-DA and 2,4,5-TA. There were 14 collaborators from the United States and Canada including 6 from industry and 8 from government agencies. The methods have been adopted as official first action. (Author abstract by permission)

80-2984. Giang, P. A.; Jaffe, H. (Livestock Insects Lab., Agric. Environ. Qual. Inst., SEA, USDA, Beltsville, MD 20705) **Infrared spectrophotometric determination of encapsulated methoprene in poly(lactic acid) formulations.** *J. Assoc. Off. Anal. Chem.* 63(4): 879-881; 1980 (10 references).

A simple infrared spectrophotometric method is described for determination of the percentage methoprene [isopropyl (E,E)-11-methoxy-3,7,11-trimethyl-2,4-dodecadienoate, Altosid, ZR-515] in a microcapsule sample of lactic acid polymer material. In the analysis, a weighed microcapusule sample was extracted with toluene-isopropanol in an Erlenmeyer flask, and the solvent mixture was evaporated in a rotary vacuum evaporator. For cleanup, the extract was dissolved in methanol and chromatographed through a column composed of sodium sulfate, silica gel, and aluminum oxide. The solvent was again completely evaporated, the dried eluate was dissolved in an appropriate volume of carbon tetrachloride, and the infrared absorption was scanned. The response can then be related by a standard curve to mg methoprene/ml. (Author abstract by permission)

80-2985. Hamilton, D. J. (Agric. Chem. Branch, Dep. Primary Ind., Indooroopilly, Queensland 4068, Australia) **Gas chromatographic measurement of volatility of herbicide esters.** *J. Chromatogr.* 195(1): 75-83; 1980 (17 references).

The vapor pressures of eleven herbicide esters were calculated from gas chromatographic measurement of relative retention volumes (dibutyl phthalate = 1) on a nonpolar SE-30 column. Measurements were made at temperatures from 72 to 182°C, but by assuming that the ratio of the latent heat of vaporization of the ester to that of dibutyl phthalate was independent of temperature, values for vapor pressure could be extrapolated to 25°C. Vapor pressures at 25°C ranged from 2.5 10^{-4} mmHg for 2,4-D ethyl ester to 1.9 10^{-7} mmHg for picloram isooctyl ester. (Author abstract by permission)

80-2986. Coutts, R. T.; Hargesheimer, E. E.; Pasutto, F. M. (Fac. Pharm. & Pharm. Sci., Univ. Alberta, Edmonton, Alberta T6G 2N8, Canada) **Application of a direct aqueous acetylation technique to the gas chromatographic quantitation of nitrophenols and 1-naphthol in environmental water samples.** *J. Chromatogr.* 195(1): 105-112; 1980 (25 references).

An improved method for the determination of low levels of nitrophenols in aqueous samples has been developed. The method is based on the gas chromatographic analysis of phenols as acetate derivatives which have been prepared directly in water. Recoveries of 97% or greater were obtained from aqueous solutions containing nitrophenols in concentrations ranging from 25 to 100 μg/l. Concentrations as low as 1 μg/l were easily

detected. Nitrophenols appear to exhibit some resistance to degradation by microorganisms indigenous to the Athabasca River. Water samples to which 139 μg/l each of *o*- and *p*-nitrophenol were added did not show evidence of microbial metabolism over a two week interval. Under identical conditions 100 μg/l of *m*-cresol was metabolized within a 3-day period. (Author abstract by permission)

80-2987. Lawrence, J. F.; Panopio, L. G.; McLeod, H. A. (Food Res. Div., Food Dir., Health Prot. Branch, Tunney's Pasture, Ottawa, Ontario K1A OL2, Canada) **Direct analysis of the herbicide barban in wheat products by reversed-phase liquid chromatography.** *J. Chromatogr.* 195(1): 113-117; 1980 (6 references).

Barban [4-chlorobut-2-ynyl *N*-(3-chlorophenyl) carbamate] is analyzed as the intact herbicide in wheat products including flour, cereal and bread. Residues of the herbicide are extracted from the samples with methanol. An aliquot of the filtered extract is partitioned between water and dichloromethane. Following this, a Florisil column (3% deactivated) is used for clean-up. The eluted barban is then analyzed directly by liquid chromatography on a LiChrosorb RP-8 column with methanol-water (60:40) as the mobile phase. Recoveries over the range of 0.1-5.0 ppm were generally greater than 80%. Detection limit was estimated to be 0.02 ppm in the samples. (Author abstract by permission)

80-2988. Boshoff, P. R.; Smuts, T. W. (Inst. Chromatogr., Dep. Chem., Univ. Pretoria, Pretoria 0083, South Africa) **Control of relative retention in gas chromatography by temperature adjustment of series coupled columns: evaluation and application to the analysis of pesticides.** *J. Chromatogr. Sci.* 18(7): 315-323; 1980 (12 references).

Eleven widely used organochlorine and seven organophosphorus pesticides were analyzed in this study, including α-BHC, γ-BHC (lindane), β-BHC, δ-BHC, dicofol, *p,p'*-DDE, α-endosulfan, dieldrin, *p,p'*-DDD, *p,p'*-DDT, β-endosulfan, phorate, diazinon, disulfoton, dimethoate, ronnel, parathion, and fenthion. Serially coupled chromatographic columns operated at different temperatures (SECAT) were used to perform the analysis. This technique can operate as a tool for the broad spectrum analysis of complex unknown mixtures. The system is equally applicable to the analysis of a specific set of substances. An example is cited where an ecologically threatened species of small fish from the Crocodile River of northeastern Transvaal, South Africa were analyzed.

80-2989. Pfeiffer, C. D.; Graham, J. D.; Nestrick, T. J.; Isenbarger, B. S.* (Anal. Lab., Dow Chem. USA, Midland, MI 48640) **Determination of chlorpyrifos in a polymeric matrix by liquid chromatography.** *J. Chromatogr. Sci.* 18(7): 330-332; 1980 (4 references).

A method for the determination of chlorpyrifos, the active ingredient in Dursban 10CR insecticide, is presented. The liquid chromatography method calls for an internal standard, and uses a polar bonded phase column validated for such determinations. Wide application is expected in the analysis of pesticide formulations. Rapid separations are possible at lower pressure. The method involves the dissolving of the polymeric sample in hot dichlorobenzene, followed by precipitation of the polymer, and analysis of the supernate directly by liquid chromatography in a 6 min time period. For a complete analysis 20 min are required.

80-2990. Deleu, R.; Copin, A. (Probl. Environ., Chair. Chim. Anal, Fac. Sci. Agron. Etat, B-5800 Gembloux, Belgium) **Separation of pesticides by capillary gas chromatography. Part 1. *s*-Triazines and substituted urea herbicides.** *J. High Resolut. Chromatogr.* 3(6): 299-300; 1980 (8 references).

s-Triazine herbicides and substituted urea herbicides were successfully separated from water or soil by capillary gas chromatography. The *s*-triazine herbicides studied included ametryne, atrazine, cyanazine, methoprotryne, prometon, prometryne, propazine, and simazine. Urea herbicides included cycluron, fenuron, linuron, metabenzthiazuron, metoxuron, monolinuron, and neburon. The use of capillary gas chromatography avoids problems of adsorption and thermal decomposition into isocyanates.

80-2991. Sherma, J.; Miller, N. T. (Dep. Chem., Lafayette College, Easton, PA 18042) **Quantitation of the triazine herbicides atrazine and simazine in water by thin layer chromatography with densitometry.** *J. Liq. Chromatogr.* 3(6): 901-910; 1980 (13 references).

A thin layer densitometric procedure is reported for residues of the triazine herbicides atrazine and simazine in water. The method is based on detection with Cl-selective silver nitrate detection reagent, after separation on silica gel G. To demonstrate the method, natural water fortified to 10 ppb with atrazine and tap water containing 10 ppb simazine were analyzed. An average recovery for atrazine of 86% was achieved with a relative standard deviation of 5.3%. Corresponding results for simazine were 83% and 7.5%. Alumina column cleanup was needed for tap water.

80-2992. Mattiasson, B.; Rieke, E.; Munnecke, D.; Mosbach, K. (Biochem. 2, Chem. Cent., Univ. Lund, S-22007 Lund 7, Sweden) **Enzymic analysis of organophosphate insecticides using an enzyme thermistor.**

J. Solid-Phase Biochem. 4(4): 263-270; 1979 (17 references).

A parathion enzyme isolated from a mixed bacterial culture was used in an enzyme thermistor device for continuous measurement of levels of organophosphorus insecticides. The enzyme was also able to hydrolyze methyl parathion, dursban (chlorpyrifos), diazinon, triazophos, cyanophos, EPN, fenitrothion, and DDVP (dichlorvos). The two devices used for the experiments were a split-flow thermistor for direct enzyme assay of medium of unknown composition, and a simpler model for inhibition studies where the pesticide being measured is known. With the split-flow thermistor device, the relative heat responses of the above listed insecticides upon enzyme hydrolysis were measured, and each was compared to a reference column filled with inactive enzyme for calculation of the amount of pesticide present. In the inhibition studies, the activity of the immobilized enzyme was first assayed with butyrylcholine substrate, then a 5-10 min pulse of the pesticide solution was passed through the column followed by another pulse of butyrylcholine. The degree of inhibition was calculated as the ratio between the decrease in peak height after enzyme exposure to the pesticide and the value obtained before exposure to the pesticide. With the split thermistor device, continuous determination of insecticides may be carried out on concentrations as low as 30 μM. With reversible immobilization of acetylcholine esterase, less than 3.4 μM of an organophosphorus compound may be measured.

80-2993. Kobayashi, H.; Kojima, M.; Matano, O.; Goto, S. (Inst. Environ. Toxicol., Kodaira, Tokyo 187, Japan) **Simple multi-residue analysis of organophosphorus pesticides by mass chromatography.** *Nippon Noyaku Gakkaishi (J. Pestic. Sci.)* 4(4): 463-472; 1979 (4 references).

A mass chromatographic technique is described which provides a reliable, selective and quantitative method for the determination of organophosphorus pesticides at the ng level. Diazinon, chlorpyrifos, dichlofenthion, fenthion, cyanophos, and fenitrothion were the pesticides examined. The selected ion monitoring technique was used, in which 3 groups of pesticides, phosphorothioate (I), phosphorodithioate (II), and phosphonothioate (III) were individually injected. The selected ions which were commonly found in an individual group of organophosphorus pesticides were monitored. The ions monitored were for I, m/e 63, 79, 93, 109, 125, and 153, for II, m/e 63, 79, 93, 125, 143, 153, and 157, and for III, m/e 63, 77, 141, 155, 157, 169, 171, and 185. Typical chromatograms of the various groups are presented along with their common fragmentation pathways and retention times. The technique was shown to be successful with field samples of watermelons and tomatoes.

80-2994. Cayley, G. R.; Lord, K. A. (Rothamsted Exp. Stn., Harpenden, Herts AL5 2JQ, England) **The extraction and assay of thiabendazole in strongly adsorbing soils.** *Pestic. Sci.* 11(1): 9-14; 1980 (11 references).

Thiabendazole is strongly adsorbed on soils, and is not readily extracted by conventional solvents. A two-phase solvent system consisting of a mixture of aqueous ammonium chloride solution (pH 10), ethanol and chloroform was developed which extracted thiabendazole from a range of soils including high-organic fen peat soils and mushroom compost. Subsequent partition of the extract between organic solvents and acid or alkaline solutions provided sufficient clean-up for assay by ultraviolet or fluorescence spectroscopy, of concentrations of less than 1 mg thiabendazole/kg of soil. Investigation of the adsorption of thiabendazole from aqueous solution by soils indicated the importance of both soil organic and mineral matter and the adsorption of both neutral and protonated molecules. (Author abstract by permission)

80-2995. Cotterill, E. G. (Agric. Res. Counc., Weed Res. Organ., Begbroke Hill, Oxford OX5 1PF, England) **The efficiency of methanol for the extraction of some herbicide residues from soil.** *Pestic. Sci.* 11(1): 23-28; 1980 (16 references).

Methanol was more efficient than solvent systems based on acetonitrile or chloroform for the extraction of a number of weathered herbicide residues from soil. The presence of water in the soil improved recovery. Methanolic extracts, on examination by gas-liquid chromatography, also gave lower background levels than the extracts with other solvents. (Author abstract by permission)

80-2996. Illes, S.; Illes, S.; Tourte, J.; Campo, M. (Lab. Chim. Appl. Expert., Fac. Pharm., Montpellier, France) **Presence d'ethylene thiouree dans la fumee de tabac renfermant des residus d'ethylene bis dithiocarbamates. [Ethylene thiourea in smoke from tobacco containing ethylene-bis-dithiocarbamate pesticide residues.]** *Trav. Soc. Pharm. Montpellier* 40(1): 9-14; 1980 (17 references) (French).

Ethylene thiourea (ETU) was collected from the smoke of maneb-treated cigarettes by bubbling the smoke first through a trap filled with equal parts of water and benzene, then through a trap with pure water. The aqueous phase from the traps was washed with benzene, evaporated to dryness, the residue taken up in methyl alcohol, and subjected to GLC with an alkali flame ionization detector. The 1.5-2 mm i.d. pyrex column used was packed with 1% NPGS on Chromosorb W HP DMCS 100/120; the injector temperature was 210°C and the column temperature 190°C. The limit of detection was ca. 2 ppm. Samples of 20 brands of cigars, cigarettes and tobaccos were analyzed for dithiocarbamate fungicides. In 7 samples, dithiocarbamate residues ranged from 1.3 to 32 ppm, expressed as carbon disulfide. When these tobaccos were smoked, ETU was

below the detection limit except in the 2 with highest dithiocarbamate contents. The yields for formation of ETU were 66% and 73% relative to the dithiocarbamate.

80-2997. Caragay, A. B.; Levins, P. L. (Arthur D. Little Inc., Cambridge, MA) **Evaluation of protocols for pesticides and PCB's in raw wastewater.** *US NTIS PB Rep.* PB-133,184: 112 pp.; 1979 (11 references).

The general EPA protocol for screening industrial effluents for priority pollutants has been tested for its applicability to the analysis of the priority pollutant pesticides and PCB's in raw wastewater. Raw wastewater from the municipal sewage treatment plant in Brockton, Massachusetts was dosed with 1-30 ppb of the priority pollutant pesticides and PCB's. The overall procedure evaluated consists of the following steps: extraction with 15% methylene chloride/hexane with centrifugation to break up the emulsion, concentration by Kuderna-Danish evaporation, removal of interferences by acetonitrile partition, chromatography on Florisil and Sephadex LD-20, and sulfur removal by treatment with mercury. Samples were assayed by gas chromatography using an electron capture detector. The data obtained show that the Kuderna-Danish evaporation step could be a significant source of sample loss unless the evaporation process is carried out at a fast rate. Treatment with mercury effectively cleans up the extracts with no significant loss of pesticides. Sample clean-up on a Sephadex LH-20 is recommended as an alternative to the Florisil column clean-up procedure. The method tested works well for parts per billion determination. (Author abstract by permission)

80-2998. Elfers, L.; Fusaro, G.; Khalifa, A. (PEDCo-Environmental Inc., Cincinnati, OH) **Monitoring system for collection and analyses of ambient ethylene dichloride (EDC) levels in the urban atmosphere.** *US NTIS PB Rep.* PB-144,819: 57 pp.; 1979 (8 references).

A method for the measurement of ambient levels of ethylene dichloride (EDC) was developed and field tested. A 24 hr integrated sample is taken with an activated charcoal tube, followed by desorption of the EDC with carbon disulfide. The carbon disulfide solution is then analyzed for EDC by separation on a gas chromatograph and detection with a mass spectrometer. Development of the method included the following area steps: selection of gas chromatographic conditions and a detection system for separation and quantification of EDC; determination of adsorption capacity of the charcoal tube for EDC; evaluation of the desorption of EDC from adsorbents under dry and wet conditions; evaluation of optimum sampling rates; determination of total method efficiency; and evaluation of the method under field conditions by use of data from field studies. (Author abstract by permission)

80-2999. Sherma, J.; Beroza, M. (Dep. Chem., Lafayette Coll., Easton, PA) **Manual of analytical quality control for pesticides and related compounds in human and environmental samples. A compendium of systematic procedures designed to assist in the prevention and control of analytical problems.** *US NTIS PB Rep.* PB-298,711: 413 pp.; 1979 (752 references).

This manual provides the pesticide chemist with a systematic protocol for the quality control of analytical procedures and the problems that arise in the analysis of human or environmental media. It also serves as a guide to the latest and most reliable methodology available for the analysis of pesticide residues in these and other sample matrices. The sections dealing with inter- and intralaboratory quality control, the evaluation and standardization of materials used, and the operation of the gas chromatograph are intended to highlight and provide advice in dealing with many problems which constantly plague the pesticide analytical chemist. Many aspects of the problem areas involved in extraction and isolation techniques for pesticides in various types of samples are discussed. Techniques for confirming the presence or absence of pesticides in sample materials are treated at some length. This highly important area provides validation of data obtained by the more routine analytical procedures. The gas chromatograph, being the principal instrument currently used in pesticide analysis, often requires simple servicing or troubleshooting. A section addressing some of these problems is included. A short dissertation of the value and need for systematic training programs for pesticide chemists is also included. (Author abstract by permission)

80-3000. Clark, E. R.; Qazi, I. A. (Dep. Chem., Univ. Aston Birmingham, Gosta Green, Birmingham B4 7ET, England) **Evaluation of the modified colourimetric method for the determination of malathion: its application to the analysis of malathion residues in water.** *Water Res.* 14(8): 1037-1040; 1980 (25 references).

A complete analytical scheme is presented for analysis of aqueous solutions of malathion at the ppm level. The method calls for adsorption of the pesticides on an Amberlite SAD-2 polymeric resin column. The chemical is subsequently eluted by an immiscible solvent. The concentrated malathion is hydrolyzed, yielding dimethyl dithiophosphate. The final step involved complexing the dimethyl dithiophosphate with bismuth (III) ions. The resulting complex absorption is measured at 325 nm after extraction into carbon tetrachloride. No interference was noted from dimethyl dithiophosphate, fenitrothion, formothion, or menazon.

See also 80-2709, 80-2722, 80-2756, 80-2796, 80-2807, 80-2810, 80-2812, 80-2813, 80-2814, 80-2848, 80-2870 *and* 80-2967.

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